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LIST OF ILLUSTRATIONS.

The Long Scale (Glover's Scale).

Lepidosaphes gloverii, PACK.

At present found in isolated localities in the Transvaal.

Transvaal Agricultural Journal.

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AGRICULTURAL EDUCATION AND RESEARCH.*

BY F. B. SMITH, Director of Agriculture.

I DO not propose to take up your time this evening in endeavouring to make out a case for agricultural education in general or for the Transvaal in particular, for to do so, before such an audience as this, would surely be superfluous. Neither do I propose to discuss agricultural education in detail, for the subject is such a wide one that to attempt to do so would be impossible within the time at my disposal. What I wish to do is to give you some idea of what is being done in other countries, and that for two reasons: in the first place, it is probable that those of you who have not been able to travel about the world very much, or who have been fully occupied with other matters, have very little conception of the enormous strides which agricultural education and research have made during recent years, and of the immense amount of attention which is now devoted to those subjects; and, secondly, because, inasmuch as we have no system of agricultural education here, and have a clean sheet to commence with, it behoves us to enquire closely into what has been done in other countries in order that we may profit by their experience and thus avoid their errors and imitate their successes. It may be urged that the Transvaal differs so widely and in so many respects from other countries that the conclusions to be drawn from what has transpired elsewhere would be of little assistance to us, but, on the other hand, it should be remembered that agricultural education has now been in vogue for a considerable time and has been tested upon such an extensive scale, and under such varying conditions, that it may be said to have been reduced to a science, the principles of which are capable of universal application. As a matter of fact, almost every country in the world of any importance from an

* Being an abstract from an illustrated lecture by the Director of Agriculture, delivered before the Annual Conference of the Transvaal Agricultural Union at Pretoria, Aug. 27, 1907.

agricultural point of view possesses a comprehensive and well-organised system of agricultural education and investigation, and is straining every nerve to render it more complete and more effective.

* * * *

For instance, in old and closely-settled countries such as England, Denmark, Germany, Holland, France, Italy and other European States in which agriculture has been practised for hundreds, and, in some cases, for thousands of years, and where, if anywhere, farmers might be expected to understand their business and to be familiar with the soil and climate and the other natural features which concern them, we find the most complete system of agricultural education and the most elaborate provisions for research. In a small country like England—less than half the area of the Transvaal—where agriculture has already been brought to a great pitch of perfection, there are some sixteen agricultural colleges and schools, whilst research is being carried on at the historic stations at Rothamsted and Woburn, in the laboratories attached to the great universities and other institutions, and at many other centres, and the annual expenditure thereon considerably exceeds £100,000.

On the continent of Europe even more pains are being taken, and more money is spent in efforts to educate and organise the farmers and to assist them by arriving at a better understanding of the working of nature and of the principles which underly their art.

Italy furnishes one of the best examples of the statement that agriculture is continually progressing, and that farmers have ever something to learn; for, as we know by the writings of Virgil, of Pliny, Columella and others, agriculture had attained a considerable degree of development in that country in the first century A.D., and yet, to-day, the State is still spending large sums of money, and to excellent purpose, in scientific investigations.

France has a particularly comprehensive and well co-ordinated system of agricultural education, and possesses 12 institutions for high agriculture, 43 institutions of a more practical character, 34 schools designed for training the sons of peasants in the practical details of farm work, 3,362 fields of demonstration plots, 77 establishments for analyses and agricultural research, and a corps of 214 itinerant professors of agriculture who give instruction to adult farmers and conduct classes in agriculture in the rural schools.

In the newer countries like the United States of America, Canada, Australia and New Zealand, the same enlightened and progressive policy is pursued.

In the United States of America and Canada, particularly, the provisions which are made for agricultural education and research, the number of people engaged therein, and the amount of money spent thereon is so great as to appear almost incredible, and yet it is found to pay, and to pay well; and the tendency is to take more pains over it and to spend more money upon it.

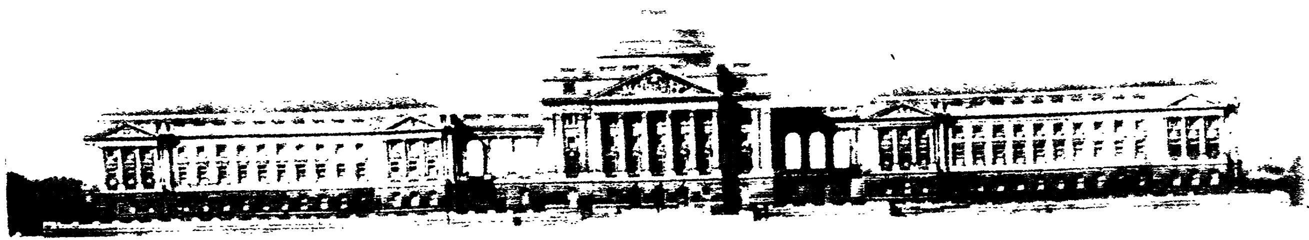


Plate 1.

The New Buildings for the National Department of Agriculture,

in the City of Washington, U.S.A.

A significant feature, and one which we should ponder deeply, is the manner countries like Russia and Japan, possessing enormous possibilities from an agricultural point of view on account of the vast areas of fertile soil and their teeming population, but in which agriculture has hitherto been conducted in a very primitive manner, are educating and organising themselves with a view of developing their resources and of obtaining their share of the markets of the world.

For instance, it is not generally known that the largest number of experiment stations in any country is to be found in Russia, in spite of the fact that the movement is of comparatively recent origin. Japan is also quietly and assiduously taking notes of what is being done elsewhere and putting her house in order, and she now has some 60 experimental stations. In India, and in the South American States, which are old and yet new, the same tendencies are being displayed.

We complain of the competition our farmers experience now, and no doubt it is severe, but there is every indication that it will become yet more severe in the future, and the point I wish to emphasise is that our only hope of success is to adopt measures similar to those adopted by our competitors.

I am aware you may think the provisions which I have described, and am about to illustrate, are altogether too ambitious and expensive for South Africa, but it must be borne in mind that the countries referred to had to begin much as we are having to begin, and that the chief reason why they are doing so well to-day is because they cast their bread upon the waters in times of adversity ; it is also well to recollect that the only means by which many of the poorest countries have held their own has been the thorough education given to their people.

* * * *

The Land Grant Colleges of the United States of America serve as an admirable illustration of the thoroughness with which the Americans set about agricultural education ; it should be explained that there is an agricultural college and experiment station in every State in the Union. The manner in which these institutions were established, and the way in which they have developed, is very interesting.

In 1862, what is known as the *Morrill Act* was passed ; under this Act 30,000 acres of the Public Lands were allotted to each State for every representative which that State returned to Congress for the endowment of a college of agriculture and the mechanical arts ; later on, in 1890, this grant was supplemented by a grant of £5,000 per annum. The colleges had not long been in existence before it became evident that there was as great, if not greater, need for investigation as for education, and that if good were to be accomplished the two must proceed simultaneously. In order that the research or experimental side of the work might not be neglected, a sum of £3,000

per annum was given out of the funds proceeding from the sale of public lands to each State for the establishment of an agricultural Experiment Station in connection with the Land Grant Colleges. Under the *Adams Act*, which was passed last year, an additional endowment for strictly scientific research was granted to the experiment stations. Thus, at the present time, there is, in each State, an agricultural college and an experiment station, both endowed, and, though closely associated with each other, yet distinct as to functions.

If time permitted it would be most instructive to discuss the terms in which these grants were made, and the precautions taken to ensure the money being devoted to the purpose for which it was intended, and the inducements held out to individual States and to private benefactors to contribute to the expenses of the institutions; this would take too long, however, and I can only add that the endowments and incomes of the Colleges and Stations have been enormously augmented by contributions from the sources referred to.

The total value of the permanent funds and equipment of the Land Grant Colleges in 1905 was estimated at the astounding total of £16,250,000, and their income during the year at £2,350,000. The total income of the experiment stations was £300,000, or, roughly speaking, about £5,500 apiece, and the staff employed by them numbered some 850 persons. The system of agricultural education in vogue in the United States of America is a very complete one and embraces all grades from the post-graduate course at the University to the farmer upon the farm and the boys and girls at the elementary schools.

* * * *

The Department of Agriculture stands at the head of the system of Agricultural Education and Research in the United States. It would be out of place to enter into details of the organisation and functions of this wonderful Department, but it may be remarked in passing that it is the largest and most highly organised Department of its kind in the world. It may also be interesting to note that our Department, though on a much smaller scale in every respect, has been largely modelled on it.

The Act which created the Department declares that its "general design and duties shall be to acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word."

The total number of persons on the rolls of the Department in 1906 was 6,242, 4,000 of whom were rated as scientists and scientific assistants, whilst the vote for the Department was over £1,435,138 sterling. It is estimated that the total sum spent by the Government in the assistance of agriculture amounts to close on £3,000,000 per annum. The building for the Department, which is shown on Plate 1, will have a frontage of 750 with two wings of 250 feet each, and is expected to cost 2½ million dollars, or, roughly, £500,000.

Plate 2.

Students Laying Drain Tiles.

College of Agriculture, University of Wisconsin.

Plate 3.

Studying the Dairy Cow.

College of Agriculture, University of Wisconsin.

Plate 4. The Utah Agricultural College.

In this paper the points I have endeavoured to establish are, firstly, the universality of agricultural education, and, secondly, the thoroughness with which the subject is treated. I have endeavoured to show what is being done in other countries, and what we must do. I do not say we shall be able to imitate the other countries altogether, but it behoves us to make a beginning without delay ; did time permit, I should be glad to point out the direction our efforts should take, but that is impossible at this hour.

In many respects, the present presents a favourable opportunity for the establishment of a sound and comprehensive system of agricultural education.

The war was accountable for untold suffering and loss, but out of evil good sometimes arises, and I firmly believe the war will mark the renaissance of agriculture in the Transvaal ; and now there is a spirit of unrest, a consciousness of a want and a desire for improvement in the air which bodes well for the future.

We have a good foundation in the Department of Agriculture and in the Experimental Farms ; there is the Beit Bequest waiting to be utilised, and I doubt not there are other wealthy men equally ready and willing to assist did they but know how best to do so, and, lastly, but not least—and I hope I am not trenching upon politics—we have a sympathetic Government, and I believe both Government and Opposition are at one in their desire to promote the agriculture of the country, and that if they meet with a little response and encouragement they will do much.

* * * *

There are just two points upon which I should like to appeal to the farmers present, or perhaps not so much to them, because I know they are too enlightened to need it, but through them to the farmers of the back country. Firstly, for their consideration and forbearance.

It is a curious fact that farmers as a class—and I can speak with authority because I was brought up amongst them—are very apt to criticise agricultural education and research, particularly in their early stages, somewhat harshly and unreasonably, and to decry the efforts made on their behalf as being unpractical and a waste of money. I do not think the farmers of the Transvaal will act thus, but, inasmuch as it is an error which farmers are prone to fall into, it may be wise to warn them against it and to ask them to enquire closely into any scheme which may be prepared and to thoroughly satisfy themselves of its usefulness or not before denouncing it. If I might venture on a suggestion, "Patient, but not too patient" should be the motto of the farmers in respect to agricultural education and research.

The second point, and I am aware it is a delicate one, is the question of imported instructors ; I would there were sufficient men in South Africa qualified to occupy the positions which will be created, but, as yet, there are not, and if agricultural education and research

are to succeed and the farmers are to be helped, it is imperative the very best men available be obtained for the various posts, no matter from what part of the world they are derived. After we have advanced so far that we have nothing to learn, then we can close the door, but at the present time we have almost everything to learn ; therefore let us make a virtue of necessity and be catholic and get the best instructors possible regardless of nationality.

South Africans are descended from the leading agricultural communities, not only of Europe, but of the world ; it is true from various causes they have fallen somewhat from grace, but I firmly believe not irrecoverably.

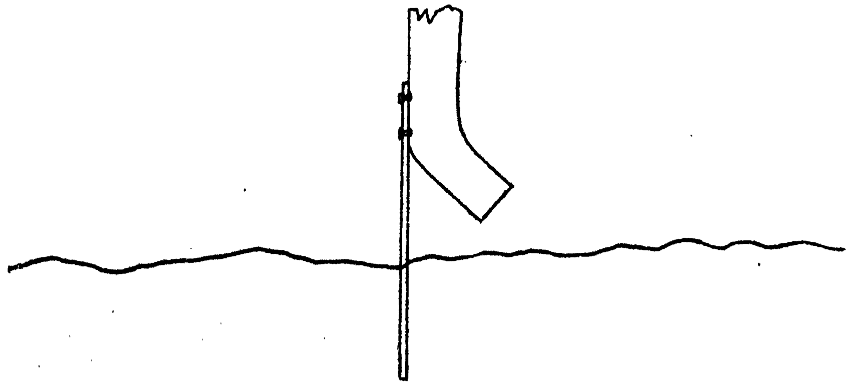
In sport our sons hold their own and even triumph over the old countries ; why should they not do the same as regards agriculture? There is every reason for thinking that, if they had the same facilities for putting out the best that is in them, and that if they devoted the same amount of work and the same passionate attention to agriculture as to sport, they would do so. Let us do our best to afford the facilities required, and so lay the foundations of a great and abiding prosperity.

EFFICIENT PROTECTION FROM LIGHTNING.

By R. T. A. Innes, F.R.S.E., Director of Meteorology.

THUNDERSTORMS are probably as frequent and violent in the Transvaal as in any part of the world. In proportion to population, the deaths due to lightning stroke are much larger than in any other place for which statistics are available. But we must not let this alarm us. Even in the Transvaal the danger from lightning is quite insignificant, but, small as it is, it is worth guarding against. Then, to many people, a heavy lightning storm, with its accompanying deafening peals of thunder is an ordeal—the idea of sudden death terrifies the nerves—so that if people can be taught how to defy the lightning, to feel that, whatever happens, they are quite safe, something useful will be done.

The construction of the greater number of houses in the Transvaal is such that absolute protection from lightning is a simple and inexpensive process. This is because so many houses are built of sheet-iron, or at least have sheet-iron roofs. Where a house is built of sheet-iron all that has to be done is to see that the iron work is carried into the ground by two or three inches. If it is a wood-built house with an iron roof, the drain pipes from the roof to the ground should be joined by metal to the roof and be carried right into the ground. If the ground is wet or damp so much the better. A drain pipe at each of the four corners of the house is best, but two pipes at opposite corners are probably sufficient. If the discharge of the pipe is above ground, it will be necessary to attach strips of iron stretching from the pipe into the ground.



The theory involved is very simple. Iron, like all metals, is a good conductor, and if the iron about a house is all joined together, and to the ground to which the lightning has to get, the lightning will

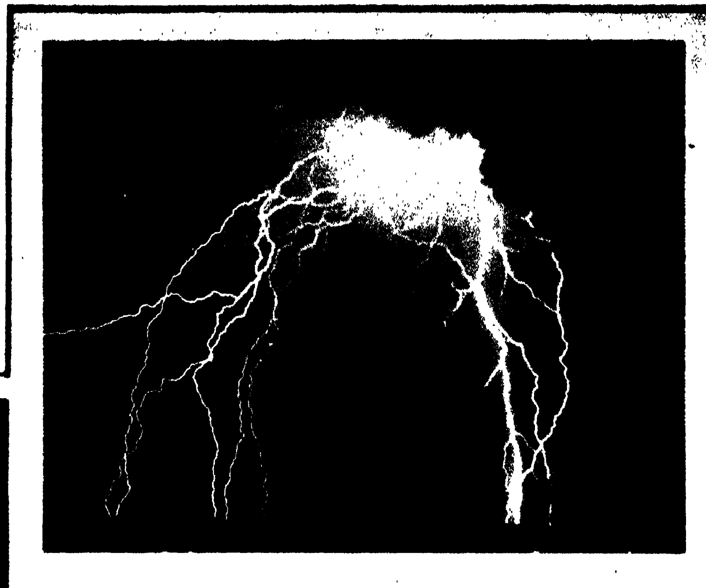
go by means of the iron and do no damage whatever. Now, suppose a disconnected iron roof—the lightning, after striking the roof, has no ready road to the ground, and, in its endeavours to find a road, may enter the house and do damage. Even so, the danger to life is small, as the lightning will almost certainly travel along the walls. If this principle is grasped, it will be apparent at once why a tent with a central pole is a particularly dangerous place in a lightning storm.

There is a slight analogy between lightning and rainfall. If the roof is intact, and there are sufficient gutters and pipes to take the rainfall to the ground the house will not get wet, and *vice versâ*, but lightning will not come through a hole in the roof like rain. What has been said about iron houses applies to all houses once their outsides have been thoroughly wetted by the rain which, fortunately, generally accompanies a thunderstorm. An unbroken, wet surface acts like a good conductor. A slate or tiled roof may be wet, but discontinuously wet—if so, lightning stroke may do damage. The most dangerous lightning strokes are those of dry storms when the lightning, striking a non-conductor such as dry wood, has, as it were, to force its way to the ground. But an iron house, properly connected to the ground, is safe at all times. It is best to be indoors during a lightning storm. It is not advisable to take refuge under an umbrella or tree or to be riding a bicycle at such times.

But let us suppose the worst happens and that someone is struck and rendered insensible by lightning. The first thing to remember is that the person is not dead but unconscious. If the body is badly burned (a very rare occurrence, be it noted) perhaps resuscitation of life will not be successful. Anyhow, strip the body at once and apply the movements used for drowned persons so as to get the heart and lungs to resume their functions. One of the weekly electrical journals publishes a sheet giving the full directions to be followed in case of apparent death due to the passage of a heavy electrical current through the body. When it is considered how very cheap these sheets are, it becomes a question if one should not be hung on the walls of every schoolroom in the Transvaal and explained once a year to the school children. In building shelters for live stock, if these are roofed with sheet iron supported and connected with iron posts, they are certainly durable and cattle under them cannot be injured by lightning.

So much for practice, but the reader may wish to know something of the theory on which the practice is founded. It was Benjamin Franklin, who, in 1749, proved that lightning was due to the passage of an electric spark, certainly a very large one, from the thundercloud to the ground. Franklin and others drew sparks from the clouds by means of wires attached to kites; this, joined to the knowledge that an electric current passes easily through a metallic conductor (such

Fig. 1.



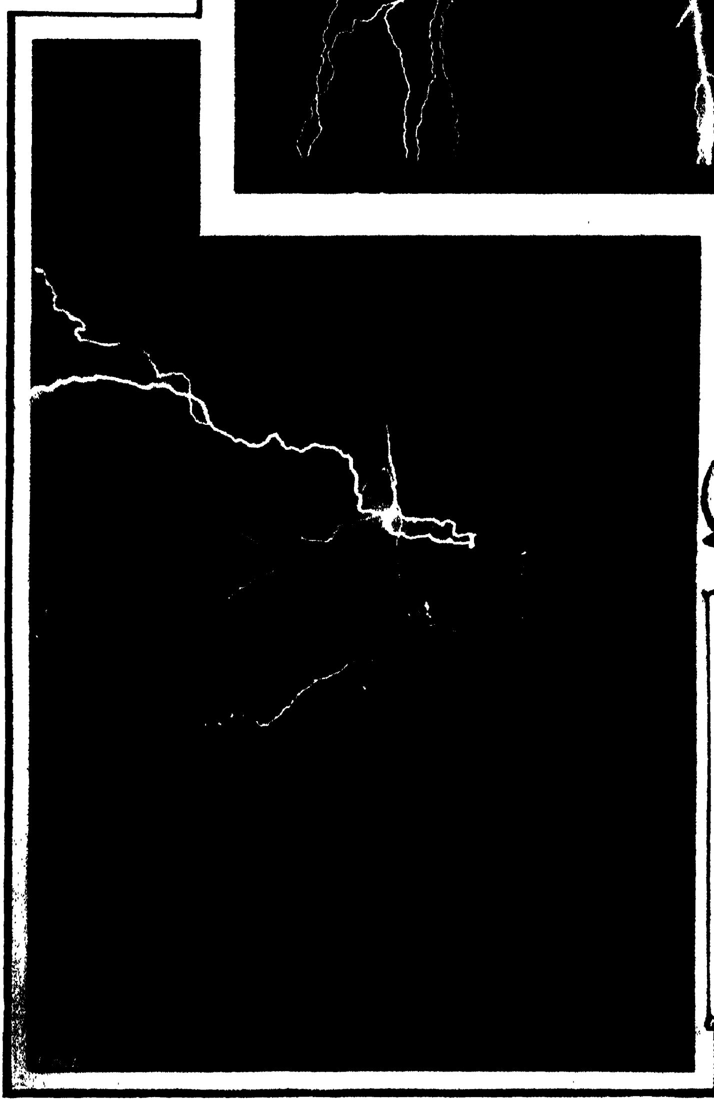


Fig. 2.

Plate 5. **Lightning Discharge.**

Photographed at Vereeniging by T. N. Leslie, F.R.Met.Soc

as a wire), gave rise to the theory and use of lightning conductors. It has been recognised for some twenty years or so past that the protection given by a lightning conductor is only partial; in fact, a lightning conductor does not really fulfil the function of conducting the lightning to the ground at all as was first supposed. The protection it gives is due to another property of the conductor

altogether. Before a lightning flash passes from the cloud to the ground, we may imagine that there is an accumulation of electricity (be that what it may) in the cloud, and a lack of it where it will strike the ground and the balance, as it were, will soon be restored by the disruptive discharge called a lightning flash. A conductor making a good contact with the ground and ending in a fine point overhead acts as a safety valve does, and allows a slow escape of the electricity to take place, so that the chances that a discharge will take place directly in the neighbourhood of a conductor are greatly lessened. The Transvaal Observatory is built on an exposed position but is well protected by conductors, and it does not appear to have been struck yet, but during the passage of thunderclouds overhead, the conductors are hard at work relieving the tension; standing below them one can hear the crackling and spitting of the sparks as they leave the conductors and so relieve the tension.

The so-called lightning flash is not often a single spark but a great crowd of sparks travelling over a wide path to the ground. This is well shown by the reproduction of Mr. Leslie's photograph. (Plate 5, Fig. 1.)

The magnitude of such a discharge as this one is proves the futility of a conductor should such a discharge happen to fall on a building. In fact, the numbers of buildings supplied with conductors which are damaged by lightning have proved that conductors do not give absolute protection. A certain quantity of the discharge will generally follow the conductor, but the building may be struck elsewhere at the same time.

Faraday proved long ago that if he placed himself in a metallic cage it was impossible to give him an electric shock; that is to say,

it was evident the electricity could not enter the cage. The Lightning Research Committee had this experiment of Faraday's in mind, no doubt, when it penned the following words:—

> *Absolute protection of the whole of a building could only be ensured by enclosing the structure in a system of wirework —a contrivance, in fact, of the nature of a bird-cage. This should be well connected at various points to earth, etc.*

It will be seen now why all-iron buildings, so common in the Transvaal, are lightning-proof, and how easy it is to ensure that iron-roofed houses may be made practically safe.

*A very large number of severe thunderstorms have occurred in the United Kingdom during the present year, and, in numerous cases, death or severe injury has resulted from lightning shock.

Whether the increase in the number of casualties due to lightning is caused by an increase in the severity of the thunderstorms in this country, or is the result of carelessness on the part of those who have suffered, it is impossible to say without a full study of the statistics bearing on the subject; but anyone who has listened to the discussion by the general public of the risks due to lightning, and of the best means of avoiding them will know that even well-educated people are distressingly ignorant on this matter. There is, consequently, some ground for the belief that were the scientific principles which are illustrated upon a large scale by Nature in thunderstorms more fully understood the obvious and imperative precautions would be more widely obeyed, and the list of fatalities would be correspondingly reduced. In this article the writer has brought together a few suggestions for the guidance of those who may be overtaken by thunderstorms when in the open country, and has explained in simple language the scientific principles upon which these are based. If all who read these suggestions will study them carefully, and, above all, discuss them with their friends, some progress will have been made in combating the general ignorance upon this highly important subject.

I.—When overtaken by a storm in open, flat country, it is best to lie down in a ploughed furrow or in any slight hollow or depression until the greatest danger is passed—choosing the dryest furrow, and taking care that you are some distance from standing or running water, and from large farming implements containing masses of steel or iron.

This rule is based upon the well-established scientific fact that any upright body or excresence upon a perfectly flat surface acts as

*To Mr. Innes' timely remarks we append the following report on "Lightning, its danger to human life, and how to avoid it," taken from a recent number of the Edinburgh *Scotsman*.—[EDITOR, *T.A.J.*]

a point for the electric brush or silent discharge, and that when this silent discharge is too slow to relieve the great difference of potential between the earth and the overhanging cloud, the disruptive or "flash" discharge occurs. By lying down, when the thunder cloud is passing directly overhead, you make yourself part of the flat earth, and the risk of acting as the discharge point is enormously reduced. The avoidance of masses of water or of metal is necessary, since these are better conductors of electricity than earth, and the disruptive discharge or lightning stroke is more likely to occur in the vicinity of such masses than at a distance from them. For this reason cyclists should dismount from their machines and lay them down some distance from the point where they themselves are stationed. Golfers should follow the same plan with regard to the disposal of their golf clubs, though in this case the added danger due to the metal is much less, and is, perhaps, negligible.

II.—When overtaken by a severe thunderstorm in the vicinity of a wood, the trees of this may be used for shelter if certain precautions are observed.

Tall trees projecting far above their companions should be avoided, especially pines; and, whatever tree be selected for shelter, it is wise to stand upon the windward side of a tree at a distance of at least six yards from the trunk. The chances of the smaller trees in the wood being struck by lightning are practically infinitesimal, and if shelter be taken at the distance named on the windward side under a tree which is struck, the person sheltering would only suffer a slight shock. Lightning fatalities in woods are extremely rare, and when they happen they are due to the slight distance separating the person from the tree trunk down which the lightning descends. Single trees or clumps of trees situated in flat, open country are much more dangerous for the reasons already given, and if shelter is sought near these, at least ten yards should separate the shelterer from the tree trunk. It is wiser, however, to give such trees or clumps of trees a wide berth when a thunder cloud is passing overhead, or, in other words, to seek open country and to lie down.

III.—Outhouses and brick buildings may be used for shelter when the precautions noted in Rule II. are followed. The lowest portions of the building should be selected, and the fireplaces be avoided; while on no account must a position be taken up between a fireplace and an open window or door, or between two open windows or doors of the building.

The lightning flash, if the building be struck, will probably follow the air currents and pass out of the house by window or door. To stand in the line of these air currents is, therefore, to court destruction.

* * * *

These three suggestions cover the whole of the risks from lightning when the storm is met with in open country. If generally obeyed, the casualties from this cause would be greatly reduced in number.

As regards the precautions to be observed when one is under the shelter of one's own roof, the remarks as regards air current under III. apply here.

All windows and doors in the house should be closed while the storm lasts, and shelter should be taken out of the direct line between the fireplace and door or window of the basement rooms of the house. If the house be in an isolated district, and unprotected by taller houses or buildings in the vicinity, a lightning conductor fixed by a competent man is, however, essential to the security of the house and its inhabitants. Lightning conductors designed and erected by incompetent persons are, however, an added source of danger.

Finally, it may be stated that three kinds of lightning are known —sheet, forked and globular.

The first of these is simply the reflection of lightning flashes at a great distance (often below the horizon), and is not dangerous to life.

Forked lightning is that caused by the actual disruptive electric discharge near at hand. The path of the flash in this case is nearly always zig-zag. This is the dangerous kind of lightning, and when the flash and the thunder follow one another closely, it is time to take the precautions named in the earlier part of this article.

As regards globular lightning little is known, since it is of comparatively rare occurrence. Well authenticated instances of its appearance, however, prove that it is not an optical delusion as some believe. The electrical discharge in this case takes the form of a ball of fire, moving slowly and quickly over the surface of the ground. It usually disappears with a loud report. Globular lightning is, of course, dangerous to life, but the fatalities caused by it, on account of its rare occurrence, are not numerous.

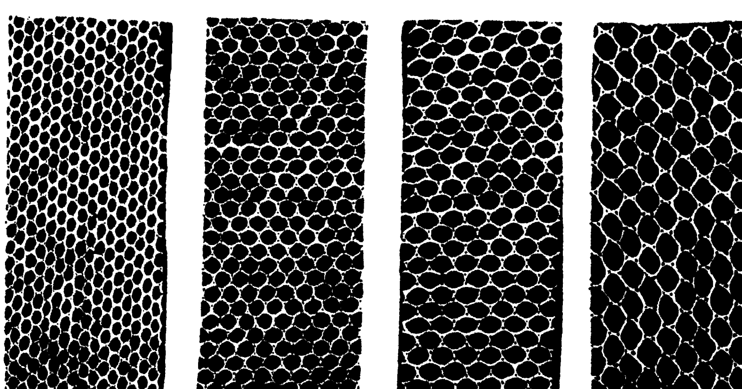
ON MOSQUITO NETS.

BY DR. F. ARNOLD,
District Medical Officer of Health, Northern Transvaal.

THE relation between malarial fever and mosquitoes was clearly set forth in the April number of this "Journal." In this article an attempt will be made to describe the use of mosquito nets both indoors and on trek.

In choosing a net for use, the chief thing is to select one of proper mesh, sufficiently fine to prevent the passage of mosquitoes, and yet not so close as to hinder free ventilation. In general, the mesh of nets sold in this country is too large. Here are shown four nettings purchased in Pretoria; the exact sizes of the meshes are reproduced. No. 1 is quite safe; No. 2 is doubtful; No. 3 is not safe (large mosquitoes pass through); No. 4 is useless (mosquitoes gorged with blood easily pass through).

No. 1. No. 2. No. 3. No. 4.



Good. Doubtful. Bad. Very bad.

It may interest readers to know how these nettings were tested. Four large pill-boxes were taken and over their mouths were stretched the different nettings. In each pill-box was put a known number of live uninjured mosquitoes. The boxes were placed on a chair alongside the bed of the writer where they remained all night. It was thought that by placing the mosquitoes near a sleeper, *i.e.*, their "meat," they would be anxious to get at him, and the natural conditions existing in a bedroom would be imitated, that is to say,

there would be a mosquito and a sleeper separated by a net. Next morning it was noted how many mosquitoes remained in each box. In this country the bell-shaped bedroom mosquito net is almost always used ; box-shaped nets are rarely seen. In Eastern countries the box-shaped net is generally used fixed on to a large four-posted bed ; such an arrangement has the great advantage that the net can be drawn tight and there is within it so large a space for the sleeper that his limbs, if uncovered, are not likely to come in contact with the net.

Frequently the bell net has too small a ring at the top and the netting is not sewn on to the calico which closes the ring, but is gathered-up above it by a running thread ; such an arrangement causes folds to be formed in the net above the ring and through the grooves of these folds mosquitoes enter freely. Again, the net is often allowed to hang loose on the bed or it is drawn over the whole bedstead on to the ground. When hanging loose it affords very little protection, for it will, during the night, certainly come in contact with the face, arms, etc., which will be bitten through the net. If placed right over the bedstead then its lower margin must be heavily-weighted with a long and continuous sand bag, and every care must be taken to drive away mosquitoes which may be sleeping on the dark under side of the mattress ; in out-lying districts white ants would, in one night, make short work of net and sand bag if lying on a mud floor. How, then, should a net be made and arranged?

Proceed as follows : Obtain a ring of wood or iron, in diameter two and a half to three feet ; close it with a piece of stout calico ; on to this calico, around the circumference of the ring, sew the mosquito net very carefully, using netting of the mesh shown as No. 1 in the illustration. Suspend the net to the ceiling in the usual way. Next arrange the bedding as is done on board ship ; that is to say, take the upper sheet, blanket and counterpane and fold the margins inwards at the sides and at the foot ; all the bedding which will cover the sleeper will then lie on the top of the under sheet. Now tuck the mosquito net under the mattress all round, drawing it tight. On going to bed draw out the net at one side, creep in under it, and carefully tuck it back under the mattress. The sleeper is now in a cage ; it does not matter how much he kicks about the net will remain true, and, provided that a fair-sized bed is used, there is not much risk of an unclothed part of the body touching the net. For use on the veld many kinds of stretchers, etc., have been devised. The writer has used a folding stretcher which carries four thin upright rods. Through eyes in the upper ends of these rods runs a cord, and over the whole structure is placed a box-shaped net. The net sold with the stretcher has its lower margin weighted ; it is intended that this lower margin should lie on the ground. But this is a theoretical arrangement. First, one rarely gets a flat piece of ground free of grass and stones whereon to place the stretcher ; secondly, a sudden

gust of wind causes the hanging net to "ride-up" on the feet of the stretcher; and, lastly, a stone or grass lifts up the lower margin of the net.

The net, etc., should be arranged as follows:—Take a large, long blanket, 7 ft. x 5 ft., fold it lengthways, and lay it on the stretcher to serve as a mattress. Arrange the blankets which will cover you just as the top-bedding is arranged for an in-door bed. Tuck in the net carefully all round under the blanket-mattress, taking especial care to cross the folds of the net round the upright rods. Crawl in under the net and close it in the usual way. The stretcher used by the writer, when opened for use, measures six and a half by two and a half feet, and stands fifteen inches above the ground. The whole outfit (stretcher, rods and net) weighs 26 lbs. and can be packed into a canvas sack measuring three feet by thirteen inches. The mesh of the netting is that shown as No. 1 in the illustration.

BEEKEEPING.

By Frederick Sworder.

Natural Swarming.

AT this season of the year, and possibly before this article appears in print, many swarms of bees will have issued unperceived from our hives. More especially will this have happened in districts where hives are favourably situated, and a plentiful supply of nectar is easily obtainable.

The effect of this abundance of nutritious food being supplied to the queen bee (particularly if she be young) enables her to lay the immense number of eggs (over 3,000) in every 24 hours. The genial weather also greatly assists in daily hatching these eggs, when, in about three weeks' time they will have developed into full-grown worker bees, and, as the population of the hive is not dying off at this rate, the inmates get very crowded. This state of things is quite noticeable to an observer during the warmest part of the day, as a cluster of bees will be seen hanging at the entrance in an apparently listless mood betokening that there is insufficient room for the population. Affairs have been known to continue thus for several days, whilst inside the hive preparations are being made for swarming, and it must be our endeavour to at once prevent a portion of the colony leaving for pastures new.

Where bees are kept in frame hives, we can, within certain limits, control the inmates by giving the required room which we should know is for their well-being and to our advantage, since during this period of preparation for swarming the secretion of honey has been largely neglected. The result is that so many pounds weight of honey has been lost to us, and, in all probability, we are minus a valuable swarm. Where a beekeeper has bees in a properly constructed frame hive, and is not afraid to carry out the essential operation of giving room by sliding on from the back of the hive a crate of sections (occupying not more than five minutes in the afternoon), he practically prevents swarming, while the bees now devote their attention to depositing honey in sections.

During the preparation for swarming, which we look upon as practically lost time, special cells, called queen cells, varying in numbers from 5 to 18 have been constructed on the combs, one cell enclosing one female egg, or the queen has laid a female egg in each of these cells. In about three days some of these eggs hatch to tiny white grubs ; these are then fed with specially prepared food for five days ; the cells are then sealed over on the ninth day from

the time that the egg was laid, and, during the remaining three or four days, the cells containing the developing occupants are strictly guarded by the workers from destruction by the mother queen.

As soon as the old queen realises that the time is approaching for one of her daughters to hatch out from one of these cells, she knows that she must say good-bye to that hive, which has probably been her home for two or more years. If she hesitates and decides to stay till one of her perfect daughters has emerged she runs a very big risk of being destroyed by this daughter, for, after having hatched, and as soon as she gains sufficient strength, she will walk about the combs in search of a queen bee, which, if found, is looked upon by her as a rival. A duel now takes place between mother and daughter inside the hive ; during this fight there is great commotion among the worker bees, but none of them interfere. In the majority of cases, although this young queen is only just hatched, she is able, when the opportunity presents itself, of inserting her deadly sting into a vital part of the apparently egg-encumbered mother queen, to which treatment she succumbs, being then dragged out of her old home by the workers.

This remaining young queen soon after, on a fine, calm day, flies out of the hive alone to be fertilised by the drone ; she then returns and becomes mistress of the hive. Her first business on taking up her maternal duties is to search every comb for any sealed queen cells ; these, where found, are ruthlessly torn down by her in order to destroy their developing occupants. In the case of a queen, which takes no risks but accepts the inevitable situation, she, on a fine day, will depart with the swarm to a spot previously selected by some of the workers, leaving queen cells to hatch out two days after the swarm has departed. If the swarm can be hived by anyone capable of accomplishing it successfully, the life of this old queen is considerably lengthened, and she lives to see another colony started, built up and well established before she, through old age, dies or is superseded by the workers for a younger one.

* * * *

Should the weather be unfavourable when the swarm is about to issue, the idea of swarming has to be abandoned for a time. In this case the old queen is now permitted by the workers to break down the most advanced and sealed queen cells, or their destruction may be completed by the workers. Thus swarming is delayed for an indefinite period or until some of those remaining queen cells in the initial stages are sufficiently advanced to permit of their occupants hatching out. Then, should the weather be genial, the swarm will issue and may settle for a short time only, on some inaccessible spot, to our great loss, the only redeeming feature and consolation being that a young queen is now installed in the old home, and, provided the beekeeper now gives the necessary room by putting on a crate of sections or shallow frames, further swarming for the season should not be anticipated.

In order to secure the best results, the hive must be full of bees, *i.e.*, it should contain from 30,000 to 60,000 worker bees with a queen not more than three years old. A queen is considered to be in her prime at her second year. Very often a novice will state that a particular hive of his last year did so remarkably well in honey production, and he looks for equally good results this year, whereas, judging from outward appearances this year, there does not appear to be the same amount of work going on as formerly.

In nearly every case this untoward circumstance is due to the fact that the queen is getting too old to lay the requisite number of eggs for the prosperity of the hive. Steps must now be taken to make an examination of the hive contents, and, where bees are kept in frame hives, we can lift out each frame separately and search for the queen and kill her, but this unpleasant though compulsory proceeding must not be done until the beekeeper is satisfied that there are eggs to be seen in the worker cells from which another queen can be raised by the workers.

Swarms often issue from the hive quite unknown to their owner, and, where labour is cheap, a boy can watch for the swarm coming off; the beekeeper can then be made aware of the fact and steps taken to secure it. But a cheaper and more effectual way is to accomplish the swarming ourselves, and this brings us to what is termed *Artificial Swarming*, which will be dealt with in a future article.

SOME ASPECTS OF RURAL EDUCATION.*

By Alex. Holm, F.H.A.S., M.R.A.S.E.,

General Manager, Experimental Farm, Potchefstroom.

IT is recognised throughout the world that a nation's stability rests principally upon the calibre of its country population, a population which has, by virtue of its virility, to be drawn upon to make good the wastage of, and the nerve power used up in, town life. The youths of the country districts provide the natural source of supply of apprentices for the country's trades and industries, besides which a large number must always settle on the land itself. The proper training of these youths, which, after all, the are nation's greatest asset, incurs a heavy responsibility upon the State. The foremost commercial nations of the world have taken the means to provide this training by the establishment of technical education. The Transvaal has also undertaken this work through technical classes, organised by the University College, Johannesburg, and held in towns throughout the country. The value of these technical classes lies in the opportunity which is afforded the youth of improving his knowledge of the particular trade, or profession, which he has adopted in his apprenticeship. But in order to instil into the pupil a desire for this further education a certain amount of instruction along these lines, insignificant though it might perhaps appear to be, must be given before he has completed his primary education. The experience of the past has shown that a restricted education in the ordinary school subjects has tended to make the country boy not only dissatisfied with country life, but has inculcated in his mind a disinclination to apprentice himself to trades involving a certain amount of toil. This has, and will, if the influence is not corrected, result in an unwarranted influx of youths to the towns seeking employment at sedentary occupations, work which in its broad sense is non-productive, and which is therefore not of the highest benefit to the State. An extension of the instruction given through these technical classes, together with the establishment of trade schools in convenient centres, will undoubtedly be a step in the right direction. So much for the education of the country boy, who does not intend to settle on the land. But the question may reasonably be asked, "Is there any reason why the education of this boy should vary from the ordinary school curriculum?"

**Being a paper read at the Teachers' Congress, Potchefstroom, on the 4th July, 1907.*

This point has loomed large before those connected with education in the country districts of England during recent years. Many authorities claim that the children are not properly educated to fit them for country life, and that this is one of the chief causes of rural depopulation. It would appear that, viewed from certain standpoints and results, there is some justification for this opinion. But the fault does not lie in over-education. You will agree that practically no limit should be placed upon that education, provided it is carried out along the right lines. This is the important point, and though education in the country districts of the Transvaal may not yet have reached that stage wherein it might, in some respects, become unfitted for the pupils, it is a point which, in the near future, should receive consideration. It has already been stated that certain circumstances have caused the country boy to become divorced from country life. Much blame must not be apportioned to him for this effect being produced. The remedy lies in broadening the lines of the education, by teaching the boy to appreciate the gifts of nature, which form his whole environment.

The ordinary child grows up, passes into youth and manhood without any real conception of the riches of nature ; he knows grass, flowers, trees, rock, water, and so forth by appearance, but he has no idea of how plants grow, the functions performed by their various organs, how soils and rocks are formed, nor even the composition of such an article of every day use as water. In all probability he has also little conception of what the atmosphere is composed, and of its importance to both animal and plant life. Give the boy some insight into these wonders, and his mind will immediately be lifted out of a narrow groove. He will then appreciate the riches of his surroundings ; he will consequently take a more intelligent interest in his occupation ; and he will not become imbued with the idea that a man does not live unless he participates in all the gaieties, and should one say the frivolities, identified with town life. It is incumbent upon us, therefore, to see that the education of our country boys is in conformity with their natural surroundings. The requirements will be met by courses on "Nature Study," applicable to country life, in elementary schools, with such demonstrations, practical and otherwise, as are possible in different places. In the schedule of classes of the Education Department provision is made for this instruction, and my desire is now to emphasise its importance. But there is the obvious necessity that the teachers themselves will require to become proficient in such teaching. I have the authority of Mr. F. B. Smith, the Director of Agriculture, for stating that part of his policy is to give facilities, as soon as circumstances will permit and arrangements can be made, for short courses on "Nature Subjects," such courses being calculated to equip the teacher for this work, and to be held during the vacations at one of the Government Experimental Farms, in all probability at Potchefstroom. Residence on a farm for a period will also, it is considered, have the advantage of acquainting the teacher with important phases of farm operations, which should result in the teacher having greater power of, and adaptability in, interesting the pupils in their studies.

I come now to the consideration of some aspects of agricultural education. Upon the development of their internal resources new countries to the greatest extent depend. The most permanent source of prosperity lies in the promotion and development of their agricultural resources, since the greater part that Nature plays in the production of any article of commerce the more is the wealth of the country producing it increased. In no industry does Nature play a greater part than in agriculture, using the term in its widest sense. The products of the agricultural industry are gained by the minimum amount of labour in comparison with the effects produced by the soil and the atmosphere.

Taking illustrations in somewhat similar conditions to those existing in the Colony, the prosperity of Australia is to a far greater extent dependent upon its output of wool than of its gold, large as this is ; and similarly that of California upon its export trade in fruit.

It is no mere sentiment, or idle platitude, to aver that the lasting prosperity of the Transvaal will be realised when its agricultural interests have become thoroughly established. Just so long as this country is unable to supply the ordinary wants of the population occupied in its gold mining industry, by a corresponding time will its true prosperity be delayed. Without digressing from the subject under review it may here be stated that in the very near future this Colony should be in a position to supply all its own requirements in meat, flour, fruits, jams, poultry and eggs and all dairy products. Added thereto it has the power, when applied, of producing wool and tobacco and some fruit as an export trade. All this means millions of pounds, which will be brought into circulation annually. Enough has now been said to justify the importance of its agriculture.

There is now, and it has not come too soon, a general awakening to the importance of developing this Colony's agricultural resources to the fullest extent, and in the fore-front of the means to be adopted stands "Agricultural Education." Knowledge, enterprise, energy and capital are the essentials to bring about the desired results. Enterprise and energy are dependent upon the character of the people, and capital, where it is not possessed, is about to be provided by means of a Land Bank and various Co-operative Societies. There remains knowledge, and this has to be gained. Without it all the other attributes will be of little avail. Without disparaging the value of the pioneering work, which the old inhabitants of this country have done in days gone by, there is a lamentable paucity of reliable data upon all matters connected with the raising of crops, the management of stock, and, until recently, the combating of stock diseases. But in these respects this country is no exception. In every new country the same lack of knowledge applicable to local conditions is felt. If the solution of problems had to be left to individuals working independently, and only through practical experience and observations, generations would be occupied in the process. The world wide competition which now exists for the world's markets necessitates a solution of these problems in the shortest

possible time, otherwise the development of the industry will be blotted out by sheer inability to cope with that competition.

By an enlightened, consistent, and progressive policy, coupled with the researches of science working hand in hand with practice, these problems will be solved in time for the present generation to benefit. To this work the prosperity of Canada, of New Zealand, of Australia, of the United States, and of many other countries owes its existence to-day, a result brought about very largely by the work of their Departments of Agriculture, and the Transvaal Department of Agriculture, now working along similar lines, will, if its present policy is pursued, achieve the same result.

Upon the younger generation of farmers, now growing up, will, in a great degree, rest the responsibility of lifting its agriculture to a higher plane. It behoves us, therefore, to provide the young farmers with that knowledge which is absolutely necessary, in order that they shall be able to turn their industry to the most profitable account. In order to do this a School of Agriculture must be established. Its importance was urged by the Commission on Technical Education, which considered it to be of "hardly less importance to the future well being of the country than a School of Mines." Such a school, or Agricultural College, must be thoroughly equipped as regards suitable buildings, materials, and an efficient staff, in order that the teachers may obtain the best results from their labours, and the students make the best use of the time spent at such an institution. Such a college should be established on a farm, whereon is represented the different branches of farming, and which is not only model, but economical, in its system of management. The location of the college on a farm not only keeps the students in touch with the work of the class-room, but the teachers are kept in direct sympathy with their work.

The expenditure involved in establishing and maintaining an Agricultural College is considerable, but the value of such an institution has been amply demonstrated by the results achieved in the countries. Thanks to the munificence of the late Mr. Alfred Beit there is considerable promise that part of his bequest will be devoted to the teaching of agriculture in the Transvaal. The present Government is also alive to the importance of this matter, and it is probable that within the next year a beginning will have been made in providing for students at the Experimental Farm, Potchefstroom.

It is important, however, that the foundations be laid for a thoroughly complete scheme, and in order to be independent of the vacillating policy, which different Governments are liable to create, a permanent endowment, either from the State or private benefactors, is greatly desired. In the United States such an endowment has been made by the Federal Government through the Morrill and Hatch Acts, which ear-marked a portion of the revenue of public lands strictly for agricultural education. This, together with the happy combination of

private effort, has made the American agricultural educational system the envy of the world. One can think of no greater benefit which a man, endowed with riches, could confer upon this Colony or upon South Africa than that he should set aside part of his wealth to assist the State in making permanent provision for this great work. Agricultural education applicable to South Africa has been fully and admirably treated by Mr. Smith in a paper read by him before the British Association. It does not, therefore, seem necessary that the same ground should be again covered in this paper.

Agricultural education naturally falls under three heads. First, the education of the farmer himself, in order to bring before his notice new and up-to-date methods connected with the raising of crops, animal husbandry, and the control of stock diseases. Such instruction is best brought home to the farmer through a series of lectures given by thoroughly competent lecturers, at different centres where it is convenient for farmers to meet. A few gatherings of this description have already taken place in the Transvaal, but the staff available for such work is too limited to permit of its proper extension. The discussion which follows the introduction of any particular subject at such meetings is of itself a valuable factor, since it ventilates the opinions of others, it stimulates enthusiasm, and the whole effect is provocative of much benefit. Through the medium of an agricultural journal, and the agricultural Press, much enlightenment can also be given. Already the Transvaal possesses an "Agricultural Journal," recognised to be the best in South Africa, and perhaps only excelled in any country by the similar publications of the United States of America.

Secondly, short courses of instruction, held at an Agricultural College, for farmers' sons who are unable to complete a full course of training. Such courses would be confined to the more practical side of agriculture, and would include instruction on such subjects as dairying, fruit culture, poultry rearing and management, the growing of crops, animal husbandry, and the care and treatment of sick animals. These courses could advantageously be held chiefly during the winter season, when farmers' sons can be more conveniently spared from their home duties.

Thirdly, a complete course of theoretical and practical instruction for those who intend to follow a farming career and those who will take up agricultural education as a profession. Such a course will necessitate at least two years' systematic instruction, and will include a study of the sciences connected with agriculture. A farmer equipped with such training enters upon his task with a great advantage. He is the better able to master the problems which from time to time confront him, and when any new system of farming has to be adopted to meet changed conditions he is generally the leader of that progress. The importance of a thorough practical knowledge must not, however,

be minimised. Science, in its relation to agriculture, is really good practice, and a good practical farmer will, in a great degree, succeed, but a purely scientific one never.

Before any system of agricultural education can be undertaken it is essential that reliable data, experience and definite knowledge affecting the agricultural industry be obtained. It has been the endeavour of the Transvaal Department of Agriculture, ever since its inception, to take steps to obtain these requirements. Already that information and experience is fast accumulating, and it is being disseminated to the agricultural population as well as present circumstances will permit. There is a remarkable paucity of qualified men capable of teaching agriculture and its allied sciences, and the want will be particularly felt in this Colony for some time to come. As in other countries, so in this, its sons should be the teachers and investigators, but provision must be made for their training, and in addition to receiving the preliminary education in this country "selected men should be sent abroad for a year or two to gain experience in agricultural administration, education and research, and so qualify for Colonial service." A policy of progress as regards agriculture is now dawning in all the South African Colonies. Let us in the Transvaal not be backward in promoting and fostering in all its branches, Agriculture, the oldest and the greatest of all the arts.

THE VETERINARY SECTION.

VETERINARY HYGIENIC PRINCIPLES APPLICABLE TO STOCK IN SOUTH AFRICA.

By Dr. Arnold Theiler, Government Veterinary Bacteriologist,
AND
C. E. Gray, M.R.C.V.S., Principal Veterinary Surgeon.

No. IV.

Parasitic Diseases of Stock in General.

In this paper, by the name parasite we mean an organism which lives on or in the body of another organism—this latter supplies nutriment and shelter to the former and is usually called the host. Parasitism is found in both animal and vegetable kingdoms, representatives of both acting as either parasites or hosts, but here we propose to deal exclusively with the animal parasites most commonly met with in our domesticated stock. Speaking in the widest sense, the term "parasitic" is applicable to most of the diseases mentioned in previous parts of this article, as the direct and indirect contagious diseases are caused by micro-organisms, either bacteria or protozoa, which enter and live on the system of an animal, thereby causing the disease, but, using the term in its more general sense, it is usually the more highly organised animals which are meant when the parasites are spoken of, most of which can be seen by the naked eye.

In many cases, the life history of animal parasites is an exceedingly complicated one, and is only partly known, hence it is often very difficult to advise as to preventive treatment in order that the parasite may be attacked at the most accessible stage of its existence. Some parasites pass through one or more stages of development within the body of a host and others outside of it—it may be in the soil or in water or elsewhere—while others depend for their continued propagation upon their transfer in an immature stage from one animal to another, in which they become sexually mature and in which eggs are produced which escape under conditions which lead to their being picked up by host number one, whence they again pass to host number two.

The task of tracing up the life-history of the internal parasites of the domestic animals is by no means easy, as it requires a zoological training of a very special kind; therefore very few are competent to undertake it, but, in this Colony, the work has already been taken up by Dr. Gough of the Transvaal Museum, who is now studying one particular class of parasites—the intestinal worms. This class

is one of very great importance as there is no doubt that the loss to stockowners, caused directly and indirectly by intestinal worms, is very serious, particularly amongst sheep ; therefore, as far as our present knowledge goes, we propose to discuss these together with any other parasites whose life-history we are sufficiently well acquainted with, and intend to indicate the best known means whereby stock can be protected against or freed from such parasites.

Generally speaking, parasitic worms may be divided into two classes : Plathelminths, or flat, and Nemathelminths, or round worms. To the former class belong the tape-worms, which are well known in their mature form to all stockowners, although everyone is not aware that the hydatids or bladder worms, which are not unfrequently met with in the muscles and internal organs of many of our domesticated animals, represent a stage in the development of the tape-worm.

A mature tape-worm has a body consisting of a large number of flattened segments, a neck on which the segments are narrower but still flattened, and a head provided with suckers or hooks by which it clings to the wall of the bowel. Each segment of such a tape-worm, when it becomes mature, is capable of producing fertile eggs ; these segments furthest away from the head being oldest are cast off from the body of the worm first and passed out of the bowels in the excreta, their place being taken by a growth of additional segments formed by the head. The cast-off egg-bearing segments fall on the ground, and if any of the eggs are afterwards picked up and swallowed by an animal suited to play the part of the second or intermediate host, the eggs then hatch out, and the embryo, which is altogether unlike the mature tape-worm, burrows its way out of the alimentary canal with the aid of the six hooks with which its head is provided, till it reaches a suitable resting place in the internal organs or muscular tissue of the host. Here it undergoes another change, losing its hooks and developing a vesicular or bladder-like body, in whose interior the head of one or more mature tape-worms is formed by a process of budding ; the process of development is now arrested, and the parasite only attains maturity if the bladder form of the parasite or any part thereof containing the head of the future mature worm is ingested by an animal suitable to play the part of the host of the fully developed tape-worm. This usually happens through the death of the animal in which the parasite passes through the bladder-worm stage, and the subsequent consumption of the organs or flesh in which the bladder-worms are located by those animals by whom the mature tape-worm is harboured. When this takes place that part of the head of the mature tape-worm which has been formed within the bladder becomes separated from the rest of the bladder, attaches itself to the lining of the bowel, and begins to form segments which go on increasing in number till the parasite attains the dimensions and characters by which it is popularly recognised as a tape-worm.

* * * *

The life-history of some species of tape-worms inhabiting man and the dog has been carefully worked out, and, in the case of some

species, the parasite can be identified in all its stages, but there are still a considerable number of tape-worms, particularly those which infest the herbivora in their mature stage, whose life-history is unknown, and of which the bladder-worm has not been found.

Some species of tape-worm produce their most serious effects when in the bladder-worm stage. Of these the most important are :—

Tænia Coenurus.

This is a tape-worm which, in the mature stage, inhabits the intestine of the dog. Dogs infested with these tape-worms scatter the mature segments and eggs over the pastures, and when these are picked up by sheep the eggs hatch out and reach the brain probably by a process of burrowing from the alimentary canal or in the blood stream. In the brain they develop into bladder-worms, which, by their pressure on that organ give rise to the condition known as dronkziekte or draaizeekte, gid or turnsick.

Tænia Echinococcus.

Is also a tape-worm of the dog, which is of very small dimensions, consisting in its mature state of only three segments. In spite of its small size it is, in the bladder-worm or hydatid stage, one of the most important of all these parasites, as its hosts include both human beings and live stock. As a bladder worm it is most frequently found in the liver, although it appears able to develop in almost any internal organ. In man, hydatid disease of the liver is a disorder of considerable gravity, and in cattle these bladder-worms are sometimes present in that organ in such numbers that its functions are completely abolished, and the organ is converted into a huge fibrous mass studded with innumerable bladder-worms sometimes weighing as much as 50 or 60 lbs.

Tænia Marginata,

Although the largest tape-worm of the dog, is of somewhat less importance. This parasite, in its bladder-worm stage, is generally found in the abdominal cavity of the domesticated ruminants, chiefly in sheep and goats, but rarely in such abundance as the Tænia Echinococcus, and, as it does not usually take up its abode in any solid organ, it causes less constitutional disturbance than the Echinococcus.

It will be noted that in the bladder-worm stage of these three tape-worms, successful treatment can rarely be undertaken on account of the difficulty of determining with any degree of certainty whether any parasites are present and where they are situated, although, in the case of sheep affected with Tænia Coenurus, the symptoms generally afford some clue. It is, therefore, incumbent upon the stock-owner to attack the parasite in the mature stage by dosing his dogs with

vermifuge remedies, tying the dogs up while under treatment, and destroying the excreta by fire. This he should do at regular intervals, and, as native dogs frequently harbour these parasites in large numbers, the risk of loss to which the stock-owner is exposed where his animals graze in the vicinity of native kraals, where large numbers of useless curs are kept, is a sufficient justification for pressing for the introduction of legislation to impose taxation upon and restrict the number of dogs kept by natives.

Tape-Worms of the Horse.

Three species of tape-worm are known to infest the horse in their mature stage, one of which is found in the large, and the other two in the small, bowels. The bladder-worm stage of these tape-worms is unknown, and, in their adult form, they are rarely seen and seldom cause any serious trouble.

Tape-Worms of Ruminants.

The domesticated ruminants of South Africa are especially infested with tape-worms. We meet them in cattle, sheep and goats, but principally in lambs and kids, and, as soon as these latter are able to pick up food, the tape-worms seem to enter the intestines, and we do not yet know into how many species these tape-worms will be finally divided. So far, Mr. Henning, at present the Principal Veterinary Surgeon of Basutoland, whilst under the Government of the Cape Colony, identified three species, namely, Tænia Expansa, Tænia Ovilla, and Tænia Centripuncta in sheep. Of these the first-mentioned one may reach many yards in length, and they must grow rapidly as very young lambs and kids occasionally discharge long pieces of segment.

In sheep in South Africa, very frequently a fine tape-worm is encountered in the gall bladder attached in the periphery of the finest bile ducts. Dr. Gough, who has given some attention to this particular species, is of opinion, judging from the many sterile worms of this variety which he has examined, that the sheep is not the natural host of this worm, and, as this or a very similar parasite is found in the bile ducts of many of the South African antelope, in duiker, waterbuck and roan antelope, it is possible that in some of these antelope this tape-worm finds itself in surroundings more favourable for the perpetuation of its species in which it attains its full maturity. This tape-worm has been described by Wolffhugel, who obtained specimens from the Transvaal and German East Africa, and has been named by him *Stilisia hepatica.*

The complete life-history of the tape-worms peculiar to ruminants are unknown. In the case of one of the more common tape-worms of sheep, the Tænia Expansa, it has been suggested that no intermediate host is required, but that the larva escapes from the egg

and is picked up with the grass, developing again into a mature tape-worm. Feeding experiments, however, do not bear this theory out, and it is more probable that the bladder-worm stage of this parasite is passed in the body of some insect which is picked up along with the food while the animal is grazing. Against this theory it has been stated that kids and lambs become infested with this tape-worm before they are turned out to graze, and while still kept in kraals, but it is doubtful whether it can be shown that young animals of this class have been prevented altogether from nibbling at herbage with which the insects containing the bladder-worm stage of the parasite might be taken into the stomach.

A full and complete knowledge of the life-cycle of these tape-worms might probably show that the adoption of very simple precautions might suffice to protect our domestic ruminants against infection, but, in the absence of such knowledge, we are only able to deal with the disease by the administration of suitable vermifuges to affected animals—therefore, the farmers should always be on the watch for evidences of parasitic infection of his stock, and when proofs are forthcoming the affected animals should be dosed immediately, and should be kept in a kraal till the effect of the medicine has passed off and the excreta collected and destroyed by fire, after which the animals should be moved to fresh and preferably more elevated pastures.

TREMATODES.

Certain internal parasites belong to another class of flat worms, known technically as Trematodes or sucking worms. Of these the best known representative is the liver fluke, *Distomum hepaticum*. In its mature form this parasite generally inhabits the bile passages of the liver of sheep and cattle, although occasionally stray specimens are found encysted in the lungs. In the bile passages they set up a chronic inflammation, which interferes most seriously with the functions of this organ, finally causing structural changes which ultimately diminish or arrest its functions to such an extent that death results. The life-history of this parasite is remarkable for its complexity, and is of such an intricate character that the difficulty of following its life-history through the various phases of development must necessarily have been very great, as the parasite passes through many more stages in the course of its development than the tape-worm. The eggs of this parasite, which are voided in the liver, pass down the bile duct to the intestine, and are expelled from the body of the host with the contents of the bowel; these eggs then hatch out in stagnant water in which the liberated larvæ swim freely about till such time as they find their first host—a small snail—they then bore their way into the body of this insect, finding the most congenial situation for their further development in the pulmonary chamber, where they become encysted, and in the interior of the cyst numerous

small bodies known as Rediæ develop which leave the cyst and travel to some other internal organ, usually the liver, where they undergo another transformation, and the resulting parasites then leave the body of the snail, and, should they reach water, after swimming about for some time they attach themselves to the leaves of those plants most commonly found in swampy places, generally to the lower leaves, entering into a resting stage, and from this position they are transferred to the stomachs of herbivora along with the herbage, whence they ultimately reach the liver where they attain maturity, and where they give rise to the condition known as fluke or rot.

From these notes it will be gathered that the fluke is, in its development, dependent on water, and it is naturally in vleis and wet pastures that these parasites are principally met with. The intermediate host, the snail, is capable of wandering away a certain distance from the water and thus distributes the parasite amongst the herbage. It will also be apparent that the conditions favourable for the development of the snail, which exist during the rainy seasons, are also favourable for the development of the fluke, particularly on elevated temperature such as prevails during the summer months, are particularly congenial to the parasite. Careful observers have noted that liver fluke is not met with in brackish water, and experiments which have been carried out show that salt water destroys both the parasite and its host. On a knowledge of these facts the steps necessary to protect animals from fluke infection may be deduced. In the first instance the herding of animals in wet marshy places should be avoided, and, during the rainy season of each year, the driest and highest situation should be selected for pasture. A liberal supply of common salt should be given to animals grazing in places which are known to be infested with fluke, and, generally speaking, the recommendations given later for the prevention of intestinal parasites are also applicable to fluke.

To the order of Trematodes belongs also the Amphistomum, a small red parasite somewhat resembling a bot, very frequently found in the rumen of cattle and sheep; but these are not considered harmful for stock. In the Annual Report of the Chief Veterinary Surgeon for the year 1903, Mr. Henning mentions an observation of an unknown species of Amphistomum in goats and sheep which suffered and died of "dik-kop" (an oedematous swelling in the head, and watery effusions into the cavity of the body). This Amphistomum was very small, being 0.5 m.m. to 1 m.m. in breadth, from 1 m.m. to 2 m.m. in length, and was of a pink colour. The abomasum (fourth stomach) and the first half of the small intestines contained many thousands of them, but they were also to be found in smaller numbers on the gullet, in the first, second and third stomachs, the small intestines, and even in the beginning of the large intestines. In about 50 per cent. of the diseased sheep and goats, the liver showed soft caseous yellow knots of an irregular shape and varying in size from a pea to a hazel-nut, while the gall in the gall bladder frequently contained specimens of the described parasite. The infected flocks

had been drinking water from an old putrid fish pond. The animals were thrice dosed with a solution of blue-stone in water, which acted so beneficially that the disease stopped almost immediately.

We have purposely drawn attention to Mr. Henning's observation, as it is quite possible that also in this country the described Amphistomum may be responsible in obscure cases of death ; it shows also the influence of bad water, and, finally, the efficacy of blue-stone for, at any rate, some of the intestinal parasites.

To this group of parasites also belongs Distomum Hæmatobium, or Bilharzia, a parasite attacking human beings, and well known in various parts of the Transvaal, and a frequent cause of haematuria in the human subject. The adult parasite lives in the interior of the larger veins and lays its eggs there—these eggs may accumulate in the small blood vessels, thus causing obstructions, inflammation and rupture, and if this takes place in the vessels of the urinary bladder, then eggs and blood are discharged with the urine. Similar parasites have not yet been found in South African cattle, but we consider it worth while to draw attention to the fact that parasites of this class have been found in Egypt, India and other places, both in cattle and sheep, living in the same blood vessels and causing similar conditions to those of men in the urinary bladder. Lately, Montgomery has described a similar parasite in the horses in India, where, in certain parts, they seem to be very prevalent. The parasite is most readily found in the liver and portal vein.

"Round Worm, or Nematodes, or Nemathelminths."

The common white worm of the horse (*Ascaris megalocephala*), which is the largest species of the genus, is known to almost every horse-owner, and is looked upon, more or less rightly, with suspicion, but the amount of harm caused thereby depends greatly on the number of parasites present. Should they be few in numbers they cause no serious disturbance, but if they accumulate in the small intestines they may seriously affect the animal's health. Apart from the permanent host this worm does not seem to require an intermediate host for its evolution, and in allied species found in man and in the dog it is possible to infect a subject by feeding it upon the eggs of the parasite. The eggs can develop in water and wet soil, and it is probable that they gain access to the intestines through drinking contaminated water.

Closely allied to the round worm of the horse is that of calves (*Ascaris vituli*)—this also lives in the small intestines and is rarely met with in adult cattle. The life-history of this worm is not exactly known, but it is probably the same as above.

The "Maw Worm."

The *Oxyuris equi*, commonly known in England under the name of "maw worm," is found in the large intestines of equines. The

male of this species is small and rarely found; it is generally the female worm which attracts attention by its somewhat peculiar conformation and long, thin tail. Oxyuris equi is frequently found attached to the anus of the horse, causing a certain amount of irritation, as a result of which the horse rubs its tail. It is considered to be an inoffensive worm which lives on the vegetable substance contained in the intestines, but the correctness of this view is open to question, as we have frequently met it in horses which were in low condition, and are inclined to attribute their poverty to the presence of this parasite.

"Wire Worms."

Strongylus contortus is the scientific name of the common wire worm (haarwormen) of South Africa. It is found here in all domesticated ruminants, and is undoubtedly a dangerous parasite, causing heavy losses, especially in lambs and sheep. In the stomachs of these animals the wire worm may be found in clusters, setting up a gastritis or inflammation of the stomach. Their presence in such numbers invariably leads to typical alterations of the blood, which, to judge from the condition of the animal, must quickly establish themselves, as infected sheep whose blood is profoundly altered may still appear to be in good bodily condition, and may even be fat. When the blood is examined by microscope, we find changes in the corpuscle known under the name of poikilocytosis, significant of an acute anæmia. This specific alteration of the blood, which is watery in appearance and does not stain the fingers, usually causes death. In other cases, where the anæmia is not so pronounced, the animal becomes poorer and principally dies of poverty and exhaustion. This change in the character of the blood to which we have referred may be due to the production of a certain poison by these parasites, which acts directly on the blood corpuscle. This parasite is ovoviviparous, that is to say, the embryos escape from the eggs practically before the eggs are expelled from the body of the parasite, and although the embryos will not develop in pure water but die therein in the course of a few weeks, they grow, however, in muddy water, and, after several moultings, reach a stage when they are ready to accommodate themselves to the conditions existing in the stomachs of ruminants and attain maturity.

It has been noticed in South Africa that an epizootic due to wire worms is principally observed in a season of heavy rains, as was the case last year, when deaths due to this parasite were reported from all parts of the Transvaal, probably as a result of the favourable conditions obtaining in wet seasons for the development and extensive distribution of the parasites, which are said by Ransom, of the Bureau of Animal Industry, to be able to crawl up the blades of grass whence they reach the stomach of their host by way of the mouth. Should the season be one in which the rainfall is not heavy, epizootics due to wire worms do not usually assume such alarming proportions, and

preventive treatment in the form of changing of pasture or of the watering place is usually followed by improvement in condition. Pasturing infected animals on high sloping ground should also be adopted when possible, and, in addition to this, a vermifuge treatment must be undertaken. Many lines of treatment have been suggested, but, so far, the most efficacious ones are the sulphate of copper treatment of Hutcheon, and the arsenic treatment as employed in Australia.

The *Strongylus contortus* is not the only species of *Strongylus*, or hair worm, found in the ruminants of South Africa, and Henning, who, at one time, devoted some special attention to this subject, identified several other species which do not, however, seem to be so important as the one mentioned. This scientist has also noted the presence of wire worms in the lungs of sheep in certain parts of South Africa. In other parts of the world this occurrence is rather frequent ; fortunately, it is not so in South Africa, and it is difficult to give a reason why these are not found more frequently, since, with the importation of sheep from various parts of the world, there is no doubt that such parasites must have been imported repeatedly.

Nodular Disease of the Intestines of Sheep.

The nodules, which are frequently met with in the walls of the intestines of sheep, are due to the presence of a larval worm, the adult of which lives in the colon.

This worm, which was first described in America under the name of *Oesophagostoma columbianum*, is met with in Australia and also almost all over South Africa, where it is spoken of as a nodular disease of the intestines. We have found these in sheep of all descriptions, ages and conditions, and there is but little doubt that the presence of large numbers of these worms occasionally cause serious trouble. Henning is inclined to connect the presence of these nodules with a disease of sheep known as "knopziekte," or "rekziekte"—this disease is caused by an invagination of a portion of the small bowel, one part of which slips into another, much as part of a stocking may be drawn inside another part. When fresh, the involved portion of the bowel is bluish black, hard, and has somewhat the appearance of a sausage, and, on being cut through, the mucous membrane of the strangulated portion is found engorged, covered with fluid and coagulated blood. The strangulated portion is called the "knop" ; in chronic cases the wall of the invaginated intestines grows together with the outer wall, forming a knot from 2-8 inches long, and sometimes the passage may completely grow together.

The symptoms of the disease are sudden loss of appetite and distinct signs of abdominal pain. The patient does not like to walk much, now and again lies down, and sometimes lies on its back ; after rising it hollows its back (Rek) and turns head and neck towards the right flank. At first sight, the belly seems to be tucked up,

but soon becomes more or less dilated ; the evacuations consist of small quantities of faeces, which soon become covered or mixed with thick blood-stained slime or even pure blood. The breathing is accelerated, superficial, and the pulse fast and wiry. The course of the disease is rapid, inasmuch as the majority of the sick animals succumb during the first week. Cases of "rekziekte" in South Africa appear to have been placed upon record about the time that this nodular disease was first observed, which suggests that there may be a possible connection between the formation of these nodules and the occurrence of this disease, as in the *post-mortems* which Henning made he found the nodules very frequent, and, in all cases, in the invaginated portions. The nodules are situated underneath the serous coat of the bowel, and it is only in recent nodules that the worm can be detected ; in the older nodules it is absent, and a cheesy mass is found, sometimes containing calcified lumps in the centre.

The disease is communicated through the vegetation of a pasture which has become infected. For the development of their embryo, the eggs seem to require a fairly moist ground.

W. Watkins-Pitchford, of Natal, who has studied this disease, says that from observations made upon sheep at his laboratory it appears probable that a sick animal can again infect itself to an unlimited extent by feeding upon grass contaminated by its own excreta. Nodules of the above description are also occasionally found in the intestines of cattle, but they seem to be due to another specie of worms (*Oesophagostomum inflatum*).

SCLEROSTOMUM.

Sclerostomum is the name of a genus of nematodes found in the large intestines of the horse, mule and donkey. Formerly, only two species of these worms were recognised, namely, *Sclerostoma armatum* and *Sclerostoma tetracanthum*—the former has now been split up into three different species (*Scl. quadriedentatum*, *Scl. bidentatum* and *Scl. edentatum*) ; it is not decided yet which is the species most frequently found in South Africa, but it is *Scl. bidentatum* which has been most frequently studied. As mentioned, the adult worm lives in the large intestines. The eggs pass with the fæces on to the soil ; here the embryos are hatched out in three or four days, after which time they leave the ova and are then able to live in a moist soil. (This first form is called the *Rhabditiform*.) They moult after 15 to 20 days, and are then able to live in water, and it is probable through this agency that they reach the intestines of the necessary equine ; they do not seem to stay long in the intestines, however, but move thence and invade the large arteries, principally into the Mesenteric arteries, from which the bowels derive their chief blood supply ; here they undergo a further development, producing what is called an aneurism of the artery. After the worm has reached maturity it returns from the artery into the intestines, where it attaches itself to the intestinal wall.

Scl. edentatum, which has been separated from the *Scl. armatum*, is a distinct species which is principally found under peretonial lining of the abdominal cavity, especially in the fat, which may be changed into a gelatinous looking mass studded with hæmorrhagic extravasations.

These worms are frequently found in foals, and it is a noteworthy fact that the æneurism which they cause in foals contain, as a rule, more worms than that of a horse, therefore the parasites are especially troublesome in young animals.

Scl. Tetracanthum.

Scl. tetracanthum is closely allied to the former species, and also frequently mistaken for it. This worm is also found in the cæcum and colon. The ova are laid in the intestines of the host and are expelled with the fæces. They also require moisture for their development, and their embryos reach their host again by the drinking water. This species of *Scl.* does not seem to wander into the intestines, but embeds itself directly in the mucous membrane. When present in great numbers the worm may cause a hæmorrhage inflammation of the bowels; usually however, they are only present in small numbers and are then harmless.

Spiroptera Megastoma and Microstoma.

The above are two parasites found in the stomachs of horses. The latter one is found in the contents of the stomach, and its presence can be detected by its undulatory movements. It is thought to be the cause of ulcers of the gastric mucous membrane. Spiroptera megastoma is found in the right half of the stomach of the horse, causing tumours varying from the size of a small nut to that of a hen's egg, or even larger, and there may be several of these tumours present. On their summit they have one or more perforations communicating with cavities which contain a greyish matter and large numbers of the worms. These tumours are situated under the mucous membrane and between this and the muscular layer. Several cases have come to our notice where these worms have been the indirect cause of death of horses—we have found that the irritation which is set up by the presence of these worms causes an inflammation outside of the stomach, and in the ligament by which the spleen is connected with the stomach, so that, finally, this organ becomes attached to the stomach and the inflammation creeps over into it. We have found in the bacteriological laboratory, in such cases, enormously enlarged spleens, which had practically been converted into one big necrotic abscess, and, by pressing the spleen, the pus could be forced through the worm holes into the stomach, thus clearly demonstrating the connection between the two. Similar observations have also been made in other parts of the Transvaal, but confirmation is wanting in the literature of this subject.

Parasitic Insects.

Perhaps the best known of these are the bot-flies, *Gastrophilus*, which are found all over the world, especially where horse-breeding is undertaken on an extensive scale. Several species are described, the most common one being known as *Gastrophilus equi*. In South Africa no attempt has been made to find out if our bot-flies belong to one or several varieties, but there is every reason to believe that several varieties will be found, since, during the war, horses from many parts of the world were imported to South Africa, and no doubt brought with them the eggs or larvæ of the species peculiar to the countries from which they come. The life-history of these flies is as follows: The female attaches the eggs by means of an oviduct, directed downwards and forwards, on the hair of the horses. The fly does not alight on the horse, but deposits the eggs whilst flying. These eggs are easily recognised, and are principally found on such places which the horse can conveniently reach with its mouth. The larvæ which hatch out of these eggs are very vivacious and crawl on the surface of the skin, and probably causing itching which impels the horse to bite the affected spot. In this way the larvæ are introduced into the mouth and reach the stomach, where they affix themselves. Here they remain, and reach maturity after about ten months, when they voluntarily detach themselves and are now expelled along with the fæces. On reaching the ground the larvæ conceal themselves either in the ground or the manure and pass into the nymphal stage in which they remain for about 30 to 40 days, after which the adult male and female insects emerge and the life-cycle commences afresh.

What are described in this sketch of the life-history of the insect as larvæ are generally spoken of in South Africa as "bots" or "paapjes." They are usually found in the left half of the stomach; that is the part which is lined by a white membrane. The right half of the mucous membrane is but very rarely inhabited by bots, and, if so, only a few. In South Africa this difference in the appearance of the two halves of the lining membrane of the horse's stomach, which is a perfectly normal condition, is often attributed to the attack of bots who are believed to have eaten off a large part of the mucous membrane, and it is generally thought that it is on this account that bots are a frequent cause of serious injury. The danger of the bot-fly is much overrated, and, if care were taken to make *post-mortem* examinations of all horses it would be found that the stomach of almost every horse which is turned out to graze contains these bots, which are only likely to be absent in well-groomed stabled horses kept inside for some length of time. We do not assert that the presence of an enormous number of bots may not injure the health or good condition of the horse, since we note in literature that, in several instances, death has been traced to the presence of bots which perforated the stomach, thus causing peritonitis, or which settled in other organs and interfered with their functions. We must, however,

state that we have found enormous numbers of bots in horses of the best condition, and which died from accidents or horse sickness, but, in our experience, we were never able to ascribe the death of a horse to the presence of the parasites. We are also of opinion that more horses in South Africa are killed by dosing for bots than by the parasites themselves. It is, however, difficult to make a layman believe that the presence of bots in the stomach but slightly interferes with the health of the horse. A prophylactic treatment for horses running in the pasture day and night is impossible, but in stabled horses the destruction of the eggs on the hair may be attempted.

Œstrus Ovis.

Œstrus ovis is the scientific name of a fly similar to the one described in the horse, which attacks sheep. The adult female is probably viviparous, and deposits her larvæ on the nostrils from where they crawl into the nasal cavities. Here they remain for about ten months until they have reached maturity. They then leave the nasal cavity, and, after reaching the ground, change into a pupa or nymphæ, in which state they remain for four to six weeks, when they moult into the adult fly. The larvæ found in the nose are generally known as maggots, and are frequently found in South African sheep. In some of them they are so frequent as to cause a mucous or even a purulent discharge, causing a frequent sneezing.

Very little can be done in preserving the sheep from the attack of the œstrus. We have, however, not heard as yet that the fly in South Africa is so dangerous as to prevent sheep-breeding, as is the case with other internal parasites.

General Symptoms Caused by the Presence of Internal Parasites.

Hitherto we have principally described parasites encountered in South African stock, giving their names and life-history as far as this is known, without entering into details of the general symptoms which their presence governs, and, although in certain instances where parasites cause local injury, we have described those symptoms which are most characteristic. We can now, however, at this stage, comment on the symptoms commonly induced by the presence of internal parasites, generally, and particularly those of the intestines, which produce more or less the same train of symptoms, which are, however, not so typical as to enable one to state definitely by which parasite they are caused. These consist principally in a loss of condition and unthriftiness in horses and cattle, and, in sheep a dropsical condition of the subcutaneous tissue of the lower jaw, and, generally, a characteristic indication of the presence of parasites. These conditions may, however, be due to other causes, and, in order to determine that parasites are causing these symptoms, their presence must be

proved. This can be done either by examining the fæces for the presence of worms or pieces thereof, and for eggs, or by making a *post-mortem* examination of an animal which has died or been killed, but it must be remembered that parasites will only cause these symptoms when present in sufficient numbers. We find, for instance, wire worms, liver tape-worms, and intestinal tape-worms in all conditions of sheep, while the round worms of horses are seen in the best kept animals, etc., and it is only in the absence of any more likely cause and in the presence of a sufficient number of parasites that we are entitled to consider them responsible for symptoms of ill-health. Attention may also be drawn to the fact that the death of a sheep may be due to the effect of worms even when these are not encountered on *post-mortem* examination, as these may have been expelled some time before, after having caused so much mischief that the affected animal is unable to recover. Speaking now, generally, of small stock infected by worms we find that the condition of their blood is materially altered. We do not consider that the actual abstraction of blood by the worms is the main cause of this alteration, but are rather inclined to attribute it to the absorption of certain toxic substances which are produced by the parasites and are absorbed into the system which have a deleterious effect on the blood, even before the animals have lost condition. Internal parasites may be observed at all seasons of the year, but they are particularly troublesome during the early part of the wet season, in rainy years, and in dry seasons during or at the end of the winter when most of the stock is usually in low condition, and a few parasites produce a more marked effect than they would when animals are well nourished. With the appearance of the first grass, however, the trouble usually disappears, probably on account of the laxative action of such grass and of the improved nutrition of the animals.

Treatment.—With but a few exceptions, the internal parasites which affect our live stock in some part of the alimentary tract or in the organs connected therewith, and, in most instances, the ova are laid inside the host, leave the body with the excreta, and develop outside. We have seen that in every case water, or at least moisture, is required for their development, and it is obvious that the entrance of the young parasites into the host is directly due to contamination of the food or water supply. Therefore, in the preventive treatment of a flock for internal parasites, both the animal and its surroundings must be considered. Moreover, animals infested with internal parasites may distribute infection and contaminate ground over which they graze, if this happens to offer suitable conditions for the development of the young parasite. Therefore, we must not only free our animals from parasites as far as this is possible, but must keep them away from moist places, and on clean veld. Since, however, stock must be watered, attention must be given to arrange for a good water supply. We know this is very difficult in many parts of the country, as running water is not to be had on every farm, and farmers depend largely on swamps, vleis and pools for their stock. Such pools and

swamps, and their moist surroundings, are the principal sources of infection from which stock become infected with internal parasites, as the excreta of the animals are washed into them and the young parasites again enter the system with the drinking water. Preventing animals from going into such places also means preventing infection with intestinal parasites, particularly in the case of sheep and goats, and, therefore, it is more economical and easier to furnish them with a clean water supply than it is to have to be continually treating the stock for internal parasites.

We have already called attention to the fact that, in rainy years, intestinal parasites are uncommonly frequent, and this can be understood in the light of the foregoing notes, as in such years it is difficult to take such preventive measures as indicated above, because water pools and moist places are then more numerous, and in these seasons especial care should be exercised in the herding of the animals—particularly small stock—on the highest grounds, preferably on sloping ground, wherefrom the water easily drains off. Unless this is done, and unless a good water supply can be provided, treating animals with parasiticide remedies at intervals becomes a necessity, and we can do this either by dosing them once or more with remedies known to kill the parasite, or supplying licks which contain a certain amount of such remedies in small quantities and which are regarded as being both preventive and curative.

The selection of remedies depends, of course, in the first instance, on the parasites present, but, fortunately, however most of these remedies are fairly effective against most classes of parasites.

Treatment of Horses Infested with Worms.—Treatment is generally undertaken for the purpose of expelling ascarides, which is one of those parasites which can be most successfully destroyed by medicine. The remedies suggested here may also be administered in cases of tape-worms and the other described "nematodes," but it must be borne in mind that the further the worm is distant from the stomach the more difficult it is to reach them by medicines administered by mouth; therefore worms living in the rectum can be more easily reached by enemas, for which purpose soap and water will be sufficient, and are very effective in treating animals infected with Oxyuris curvola. A common and good remedy for worms in horses is 2 ozs. to 3 ozs. of turpentine in a bottle of raw linseed or castor oil administered by the mouth, *not* through the nose as is the frequent practice in this country under the assumption that this is the easiest and speediest way for the medicine to reach the stomach.

Sulphate of copper, or bluestone, is another very effective remedy, which may be given in doses of 2 drachms, dissolved in a bottle of water, and repeated for a few days.

Arsenic, or arsenious oxide, is one of the best vermicide medicines known, and although arsenic is a poison and only obtainable at a chemist's shop, it is within reach of almost ever yfarmer, as it is an ingredient of Cooper's Dip, and doses of this preparation are generally

indicated in teaspoonfuls, which, according to a Cape Colony pamphlet, contain about 135 grains, of which about 24 grains are arsenious oxide and about 5 grains arsenious sulphide, or very nearly 29 grains of white arsenic or arsenious oxide. For horses up to half-a-teaspoonful may be given with safety, and should be repeated several times with an interval of a week between the doses. The dry powder can be given on the tongue, or, better still, mixed with a little salt in bran. A systematic treatment with arsenic or Cooper's Dip with smaller doses, giving a daily dose of one teaspoonful of a mixture of one part of Cooper's Dip to four or five of salt is advisable in most cases of worm infestation, but it should be continued for at least a fortnight.

Treatment of Horses Infested with Bots.—Our opinion regarding the damage done by these parasites has already been given, from which it will be seen that we do not attach much importance to their presence. Under certain conditions they may interfere with the condition of a horse, and their removal is, therefore, desired. We do not believe in the efficacy of the many common remedies in use against bots, since these larvæ appear to have high powers of resistance when experimented with various parasiticides. The remedy which, so far, has given the most promising results is one tablespoonful of bisulphide of carbon mixed in a bottle of raw linseed oil. Bisulphide of carbon is usually within reach of the farmer, although it is a poison and it should not be forgotten when handling it that carbon bisulphide is very volatile and highly inflammable.

Worms in Calves.—Here turpentine is also recommended as a cheap and effective remedy; calves require about a tablespoonful, which should be mixed with castor or raw linseed oil.

Sulphate of copper may also be used with advantage in some cases: for 6-month-old calves, about half a drachm dissolved in a pint of warm water should be given on an empty stomach.

Arsenic is a dangerous medicine for cattle, and an overdose easily possible; therefore young calves should not receive more than young sheep.

Worms in Sheep and Goats.—Tape-worms and wire-worms may be treated with the same remedies. As a preventive treatment the following mixture is recommended: Cooper's powder, 1 part; flower of sulphur, 3 parts; powdered slaked lime, 3 parts; common salt, 30 parts. This has to be mixed very carefully. A teaspoonful of this mixture could safely be given for a week and continued every alternate week. For the treatment of infested sheep, Cooper's Dip is also given, mixed with one part of the powder, to 10 parts of the salt or sulphur, a teaspoonful of this mixture being the dose for a sheep. Lambs under 3 months old should get about one-third of this amount. Cooper's powder may also be given unmixed, but the animals should always be fasted before the medicine is given.

Stockholm tar is a remedy for worms in sheep which can also be recommended. It is highly spoken of by many farmers not only in South Africa, but in other parts of the world. A teaspoonful for

a lamb, and a tablespoonful for a sheep is the dose. This may be repeated at short intervals.

In Australia the following treatment is favourably recommended for the treatment of worms: arsenious oxide, 1 oz.; washing soda, 1 oz.; sodium bi-carbonate, 1 oz.; mixed together and boiled with a few bottles of water; after the ingredients have dissolved, dilute with 12 gallons of water. A full-grown sheep should receive about 1 gill of this liquid, viz., about a sauce-bottle full.

The treatment recommended by Dr. Hutcheon in his article on the subject of worms in the domestic animals is exceedingly effective, and is quoted beneath:—

"In using the blue-stone solution for the destruction of the stomach wire worms of sheep and goats, the solution should not be stronger than 60 bottles—nearly 10 gallons—of water to 1 lb. of commercially pure blue-stone, and that the doses should be correspondingly increased as follows:—

For lambs 3 to 6 months	.. ..	1½ to 2 ounces.
„ „ 6 to 9 months	.. ..	3 „
„ „ 9 to 12 months	.. ..	3½ „
„ „ 12 to 18 months	.. ..	4 to 4½ „
„ „ 18 months and over	.. ..	5 „

"The experiments clearly indicate that larger doses may be given with safety, but I am anxious not to endanger the use of this remedy, which, although it has recently been getting into bad repute, is the only mixture I have seen tried which is effective in killing these stomach wire worms at a *single* dose if the stomach is empty and the solution enters it in sufficient volume. Further, there is no mixture which sheep and goats will drink so readily as the blue-stone solution.

"*Directions for Dosing.*—Fast the flock for 24 hours—when large flocks are being dosed, if a 24 hours' fast has expired before commencing to dose, it will often be nearly 30 hours before the last of the flock is finished. This may be avoided by dividing the flocks so that their fast can be regulated. The flock should be kept away from water during the day that they are dosed. In dosing goats, they should not be placed on their haunches, but allowed to stand as quietly as possible. The assistant places the goat between his legs, takes hold of its horns and raises up its head until the nose is on a level with the top of the head; the person giving the dose places his hand over the goat's nose and inserts one or two fingers into the left side of its mouth to open it, at the same time, with the right hand, he inserts the neck of the bottle gently into the right side of the goat's mouth on the tongue, and pours the medicine steadily down, just as fast as the animal drinks it. Do not attempt to pour medicine down while the animal is bleating, as it is liable to do at times when roughly handled; under such circumstances the medicine will certainly enter the larynx and descend to the lungs, causing acute inflammation in these organs, generally terminating fatally. In like manner, if the

goat coughs when the medicine is being given, the head must be dropped at once to prevent it from choking. In dosing sheep the same directions should be followed, only the sheep may, with advantage, be set on their haunches, as, being without horns, their heads can be steadied better by the assistant in that position than when standing. No attempt should be made to force the sheep's mouth open, and held straight up while the medicine is roughly thrown on the back of the throat; the animal is almost certain to cough and a great many may be choked, and, although comparatively few may die at the time, a large number will suffer from inflammation of the lungs to a greater or less extent afterwards, and, as a consequence, they will not thrive, and the blue-stone will get the blame for ruining the constitution of the sheep. I have seen a flock that had been dosed in the rough and hurried manner above described stand coughing in a most distressing manner for hours, and many of them for days afterwards, whereas, if proper care and patience is exercised, very few should be heard to cough at all after being dosed, and few accidents of any kind should occur."

If this line of treatment is adopted it is always advisable to test the activity of the solution of blue-stone by dosing ten or twelve of the more weakly of the flock and waiting to see the result before treating all, as samples of blue-stone appear to vary somewhat in strength, and it may be found desirable to reduce the dose somewhat if the treatment appears likely to prove too severe.

Apart from the enumerated remedies for the treatment of worms, there are several others, but the ones given have been selected for three reasons (1) on account of their cheapness, (2) the ingredients are all within easy reach of the farmer, and (3) the efficacy of these remedies have been proved, not only in South Africa, but nearly all over the world, and, accordingly, they are the ones in most common use.

(Concluded.)

COMMUNICABLE DISEASES OF ANIMALS. THEIR ERADICATION.

By J. M. Christy,
Assistant Principal Veterinary Surgeon.

Unless we perfectly grasp and understand the meaning of the words communicable diseases of animals we will experience some difficulty in appreciating how such diseases should be combated against and finally got rid of. I wish to discuss this subject in a simple manner for the benefit of our farmers and live stock owners in this Colony.

A communicable disease must have a pre-existing one to give rise to it; that is to say, it cannot arise spontaneously. To put the matter in a simple way, we know that it is impossible for any particular plant

or animal to appear, arise or exist unless it is the offspring or descendant of parents having similar characteristics—in other words a horse, a sheep, a mealie or a potato can only be bred or raised from animals or plants of the same kind. A recognition of this immutable law of nature is the fundamental ground work of all laws and regulations enacted by civilised communities to prevent the spread of and finally to eradicate all such diseases. To go a step further, and yet hold to this analogy, it may be pointed out that communicable diseases of animals are all due to living organisms, which must have pre-existing organisms to give them birth.

So far as our knowledge goes the most important of these disease producing organisms require to inhabit the bodies of living animals to reproduce themselves and to complete their life cycle ; but some of them may exist, reproduce themselves, and complete their life cycle independent of animal hosts.

The presence in an animal's body of disease producing organisms is made manifest by the animal showing symptoms of ill-health, the symptoms varying according to the different organism that has entered the system and is there reproducing itself. It is then that the existence of these organisms or germs can, as a rule, be most easily detected, and that they can be diagnosed and destroyed, not only in the animal itself but in his environment by disinfection, etc.

A great opportunity is thus given to destroy these disease producing organisms when we know definitely that they are in an animal's system and probably his surroundings, and we can then take such steps and precautions as will render it impossible for them to gain access to the bodies of other susceptible animals, and so continue their disease producing and destructive career. Concisely this is how the matter stands. If you destroy any particular plant or animal in any country, or make it impossible for them to obtain the particular food or soil necessary to their growth and development they will vanish. Where you have destroyed them they cannot again appear unless brought in from other countries. But to deal with them we must first know where to find them, and the conditions under which they thrive.

Some communicable diseases of animals appear to be indigenous to certain parts of the world—that is to say, they have been known to exist there since the earliest records, and do not give way as readily to scientific preventive treatment and regulations as in countries into which we know they have been introduced during historic times. For instance, think of rinderpest in the steppes of Russia, Egypt, the Soudan and the plains of India.

With the exception of horse sickness in equines, blue tongue in sheep, heart water in sheep and cattle, tsetse fly disease and biliary fever in equines and dogs, few, if any, of the important communicable diseases of animals are indigenous to British South Africa, therefore it at once becomes apparent that all the other communicable diseases of animals can and should be got rid of from those territories.

That all owners of live stock in British South Africa are desirous of and anxious to assist at arriving at this desirable end goes without

saying, and that they would do all in their power to have clean flocks and herds is certain ; but it is only reasonable that they should ask how can this best be done, more especially in view of the fact that most of them have been accustomed to look upon these diseases as evils that cannot be contended against, in fact have stoically accepted them as part of their life burdens. At least judged by their actions and public utterances such would often appear to be their mental attitude.

* * * *

The most important of the exotics or communicable diseases of animals that we have to deal with to-day in this country are glanders, lung sickness, scab, ulcerative lymphangitis, equine mange, swine fever, ordinary redwater and East Coast fever. The loss these eradicable diseases of animals cause the country yearly is hard to estimate, but that it is hundreds of thousands of pounds few will be found to deny.

These diseases can only be efficiently tackled and economically overcome by a central organisation properly equipped and endowed with the required authority. Specially selected and trained men only should be employed on work of this kind. The world is not lacking in precept and example here. Consider those countries where the most serious of the animal pests have been exterminated, and you will find that they are the countries which have employed fully qualified experts, and were guided by their advice.

The Transvaal has at the present time a fairly well equipped Veterinary Division, the members of which can be relied upon to see that the regulations regarding diseases of animals are properly carried out, and we know that these regulations are sound, and based on exact scientific knowledge. Nevertheless no veterinary staff, however efficient, and no laws however drastic, can avail anything unless individual owners recognise their responsibility, and determine to assist and co-operate sympathetically with the central organisation in the crusade against communicable diseases.

The crux of the matter is this, the authorities appointed to deal with such diseases can only act when they know of the existence of these diseases, and the co-operation asked for from owners is that they, in their own interests and that of the whole community, should give early notification of the appearance amongst their animals of any suspicious symptoms. By so doing an opportunity will be afforded to have the trouble investigated, proper advice given ; and, should the disease be one capable of spreading to other susceptible animals, steps can at once be taken to prevent it so doing. It is always assumed that the Government will maintain an adequate trained staff to meet all requirements.

* * * *

To turn to indigenous diseases. Everything points to the fact that the solution of this problem will be found in protective inoculation ; indeed, judging by the results of our efforts along those lines the future is not without hope, still, unless the owners of animals have faith in the task of eradicating these diseases they will surely be

multiplied one hundred fold. Many of the communicable diseases are spread by intermediary hosts, the ticks being the greatest offenders in this respect, therefore it would appear to be incumbent on farmers to have dipping tanks on their farms, through which they could run their animals at stated intervals. The financial difficulties that beset the farmer in this respect are fully recognised, but facts are facts, and must be faced. Doubtless dipping tanks might be erected by co-operative societies, and would be of great assistance to many small owners of stock.

A most essential point for any country capable of doing an export trade in animals is that it should be able to show a clean bill of health. Is it too much to expect that some day South Africa will be able to do an export trade in live stock? Should that day arrive it would be a pity to find that the markets of the world were closed against us, because we were not able to guarantee that our animals were free from communicable diseases, but, even assuming that this country can never do so, all that is humanly possible to get our flocks and herds free from disease is so apparent and patent to every one that it savours almost of the absurd to write a paper with the view of bringing home to all our clear duty in this respect.

In dealing with diseases owners should certainly strive to find out all that the latest science has taught—then, and only then, will they appreciate how best to eradicate them; and they will be the first to insist that such diseases shall not be allowed to exact a heavy annual toll in money and kind, and they will see that the carrying out of these laws are placed in the hands of independent experts.

Everyone will admit these broad facts, but how few realise what they mean to a country? I look with something akin to awe and amazement at owners of large numbers of animals, who, as it were, remain satisfied to accept the seeming inevitable. Let us recollect what has been done with rinderpest in this country, and with rabies, foot and mouth disease and lung sickness in Great Britain and Ireland, and scab in Australia and New Zealand; and remember that in none of those countries were any of these diseases dealt with on proper scientific lines, even so late as twenty-five years ago.

TRANSIT OF LIVE STOCK BY RAIL.

By J. M. Christy, A.P.V.S.

To breeders of live stock the means by which they can send their animals to the markets available to them in an expeditious manner, and without serious deterioration in condition, is a most important question, calling for special consideration from them.

In new countries, where the land is only partly occupied, this question does not assume such grave proportions, because if markets are available, animals can be driven long distances to them, living on the country as they go, but in a land every acre of which is owned by

someone, this cannot be done, for obvious reasons. We are, therefore, in occupied and settled countries faced with the problem of how best to get our animals to markets that, as a rule, are far away from us. Railways properly equipped appear to be the only way of doing so. Animals can be conveyed long distances by rail in a comparatively short space of time, without suffering in any way or losing condition. This is an every day experience in most countries of the world, and cognisant to all of us. At the same time it is a duty we owe to the lower animals to see that on railways proper facilities exist for handling the live stock trade done by them ; namely, that at all stations where live stock are trucked and detrucked proper facilities to do so are provided, and that such places, and likewise the trucks in which animals are conveyed, are under proper supervision, so that they cannot become disease disseminating centres ; and further that during the time the animals occupy them they shall not want for food or water, for it is lamentable to observe that no facilities are supplied by the railway companies to enable them to satisfy their natural instincts in such matters.

To put the matter in a concise way the following points appear worthy of note :—

(1) That at all stations where it is intended to truck or detruck live stock proper facilities in the way of live stock platforms, fitted with kraals, feeding and watering troughs, etc., should be erected by the railway companies in order to meet the requirements of the trade of each particular station—humanity alone requires this—to say nothing of its commercial wisdom.

(2) That all trucks intended for the conveyance of animals for journeys of twelve hours' duration or over should be built specially for handling that sort of traffic only, and be fitted with hay racks, and water troughs, the latter to be like those in use on most of the American railways, which are made so as to fit into the side of the truck, and can be pulled down and filled at stations where watering facilities are provided, and then put back into their places when finished with.

(3) That trucks, live stock platforms, kraals, feeding and watering troughs at stations should not be used again for live stock until they have been thoroughly cleansed and disinfected. An independent supervision over such by a responsible Government official to be insisted upon.

(4) That trains conveying live stock should be run as rapidly as possible, and that on arrival at their destination the animals should be cleared as soon as possible. The shunting of live stock trains should be avoided as far as possible—they should run direct to the live stock platforms at each station, and have right of way of all trains except mail trains.

* * * *

Looking at the matter from a broad point of view we see that the great majority of the railways of the world are owned and operated

by companies, and that in most of the older countries competition between rival companies is so keen that the slightest hint or suggestion is, as a rule, sufficient to awake their interest, and that they are quick to take any reasonable steps to make the lot of the animals entrusted to them for transport as good as it can be, thus ensuring that as great a volume of live stock trade as possible shall go over their lines. Business men take advantage of these competitive conditions to insist that their animals shall be well provided for by the companies, still we know that the companies are not left entirely to themselves ; on the contrary, a close Government supervision is exercised over them.

We all acknowledge our responsibilities towards the lower creation. Therefore it is incumbent on us when, for our commercial advantage or pleasure, we desire to send them long distances by rail to see that their lot is made as comfortable as can be under the circumstances. In dealing with animals humanity and commercial wisdom go hand in hand, though at first sight to some the exact opposite might appear to be the case.

The stock raising industry in South Africa is a most important one, and is bound to become much more so in the immediate future than it is to-day. Let us hope that it will in no way be hampered by inadequate railway facilities, but that on the contrary the farmer will be able to put his animals on the train and deliver them at markets hundreds of miles away in as good condition as when they left his farm. That this can be done experience proves. Our railways should be such that animals conveyed by them shall not be exposed to the risk of contracting disease during the journey, and that instead of the journey injuring them in any way they should arrive at their destination in as good if not better condition than when they started. This is not an impossibility, it is simply what should be. To handle our live stock traffic as humanely as economic conditions will allow must certainly tend to promote the welfare of all our citizens. In dealing with live stock humanity, commercial wisdom and scientific knowledge are inseparable ; and they should be our guiding principles as regards the transit of animals by rail.

SHOW RING IMPRESSIONS.

By S. J. Johnston, M.R.C.V.S., Government Veterinary Surgeon.

Although much has been written in this "Journal" by many pens, and under various headings, about horses and their breeding, yet a visit to the horse section of any of our agricultural shows will convince the most ordinary observer that there still remains much to be desired in the class of animal exhibited. Unfortunately, this is most noticeable in the classes for stallions, for not only Colonial bred animals, but also many imported sires are very inferior, and do not

tend to improve the breed of horses in this Colony. In "Colonial bred" sires, the chief defects are want of bone and size, defective action and conformation, while in "imported thoroughbreds" again bone is usually deficient, but they often err in the other direction in regard to size, being usually too long in the leg, or, as it is often defined, as "showing too much daylight beneath them," whilst defective action is also too often found as well.

Defective action is seen when a horse in any of his paces so moves one or more of his limbs to the danger of injuring another limb or any other portion of his anatomy. The most common and worst forms are brushing and speedy cutting. "*Brushing*," or striking the inside of a fetlock joint with the opposite foot while in motion, may be either in fore or hind. "*Speedy Cutting*" signifies the striking of the inside of one knee by the opposite foot. Both these defects are dangerous, and result in many a bad fall to both horse and rider. As these are usually found in narrow-chested animals with turned out toes, it is the conformation that is at fault, and sires with these defects should not be bred from. The refusal of any animal with this sort of action is one of the creeds instilled into all buyers of military remounts, and very wisely too.

The remedy for this is obvious, viz., the early and free use of the castrating knife amongst your colts and the use only for stud purpose of short-legged horses with "trim action," plenty of bone and substance, well proportioned, and suited to the majority of your mares, *i.e.*, being extra strong in their weak points and intensifying their strength. Above all things develop *more bone*, but do not attempt to get it through cart horse or hackney blood, for you cannot breed riding horses that way, and you do not want hairy legs nor high steppers for your Cape carts ; you can get it by carefully selecting thoroughbred stallions with good bone, and in that way only can you continue to produce the class of horse for which South Africa is justly famous.

It is gratifying to note, at some of the agricultural shows more particularly in districts where good thoroughbred sires have been used for some time, a marked improvement in the youngsters exhibited. It is an object lesson not soon forgotten to see how they show up in comparison with those from common bred stallions, and where they have been well wintered they compare favourably with those of any other country at the same age. And the better wintering of foals is a plea I would urge upon all horse-breeders, for that is the period when they are either made or marred so far as growth is concerned.

In reading the reports of some of the more recent agricultural shows in the Transvaal it was very pleasing to see that some of the judges in the horse classes had the courage of their convictions, and showed it by refusing to confer premier honours in classes for stallions where sufficient merit was not shown. In regard to this matter I hold

that it is a breach of trust for judges to decorate a stallion with a 1st prize card or rosette just because it happens to be the best of the lot exhibited ; in riding, driving, or in any other classes, by all means give a 1st prize to the best animal on the showground, but in a class of animals kept for the purpose of reproducing their species, if not up to the standard, then rigidly withhold it. There is an enormous amount of damage done in this way, and the effects are more far reaching than we imagine. Those rosettes and prize cards are kept on show, and are produced along with the horse for the admiration (and most people do admire the glossy coat, crested neck and flowing mane and tail of a stallion) of every visitor to the farm or stables. And as one naturally expects a judge to have been selected for his special knowledge of the class of animal he adjudicates upon, it is small wonder if the ordinary individual, be he owner or spectator, gets a very inflated idea of the merits of a stallion, when he sees that "experts" have selected him for premier honours, and most people would certainly expect such an animal to be good enough to put their mares to.

One must not, however, put all the blame upon the stallion if the foals are not so good as expected. That "like begets like" is a true saying to a large extent. So you cannot expect a well-proportioned foal from a mare with any serious defects either of conformation or soundness. This was well exemplified at a recent agricultural show where I was judging, in a class for brood mares. An otherwise useful mare, with sickle hocks and a tendency to curbs, was exhibited, and her foal had the same class of hocks, but with *enormous curbs* ; and besides it had misshapen front legs. Upon enquiry I found that the sire was on the show and had the same defective fore legs as this foal, his progeny. So you see in this case the defects of both parents were impressed upon this offspring.

Attempting to breed from old mares (for they do not always succeed) is often attended with much heart-burning, and occasionally ill-feeling, more especially in the case of a novice at horse-breeding. An old mare, which is lame, or too worn for further work, is selected as the foundation of his stud, and is usually sent to a stud farm to be served by an approved sire, and if, as is often the case, she fails to become pregnant, abuse is heaped upon both the owner and the stallion ; while, if she does prove in foal it is usually of such a degenerate type that the abuse comes just the same. The owner forgets, or does not understand, that the uterus (foal-bed), like other muscular organs, atrophies or shrinks if not used, consequently the foal "in utero" cannot grow to its proper size in old mares that have not been bred in their youth ; and besides, they rarely have sufficient milk to sustain a foal, from the same reason.

While deformed, old or unsound mares should not be bred from, yet we must remember that it is pretty generally accepted amongst breeders that the male parent influences the outward formation particularly, *i.e.*, the external structure and organs of locomotion ;

while the female impresses the internal organisation and temperament. Of course there are some exceptions.

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Hereditary unsoundnesses are happily comparatively rare in South African bred horses. Those which disqualify thoroughbred sires are as follows: roaring, whistling, ringbone, spavin, unsound feet, navicular disease and cataract. While these diseases are more or less rare, yet at a recent show a stallion exhibited in a class for South African bred could be heard distinctly roaring at a trot, needless to say he was disqualified. In view of these facts, and to protect the public, I would suggest that all stallions standing at stud should have a veterinary certificate that they are free from any hereditary unsoundness.

In conclusion I would again impress upon breeders the necessity of the early castration of their colts, bearing in mind that half-bred or common-bred stallions very rarely beget anything as good looking as themselves, and although you may sell a few upon the reputation of your horses for being good hardy enduring animals, yet as horses get more plentiful, as they are bound to do in a few years, private consumption will not suffice to take them all, and you will have to put them on the open market. And there you will find those who have bred the sound, good-sized, well-shaped animals will draw the most money, because the buyer only pays for what he sees.

Someone has said that "a thing of beauty is a joy for ever." In applying this to horses I will not vouch for the long and lasting joy, but certainly a sound, handsome horse is more easily disposed of, and puts more into the pocket than his plainer brother, no matter how serviceable the latter may be.

THE CHEMICAL SECTION.

No. 1.]

THE COMPOSITION OF SOME TRANSVAAL FODDERS.

By Herbert Ingle, B.Sc., F.I.C., F.C.S.

In recent numbers of the "Journal"* I discussed the composition of many forage crops with particular reference to the relative proportions of lime and phosphoric acid contained in their ash, and the effect produced upon bone nutrition of the animals fed upon these crops.

Attention was also directed to the importance of a "well-balanced" ration, *i.e.*, to the use of a diet containing a proper proportion of nitrogenous constituents or albuminoids to non-nitrogenous substances—carbohydrates and fats.

It was shown that the widely used oat-hay, and even a mixture of oat-hay and mealies do not constitute a suitable diet for the requirements of many animals from either of the above standpoints, and the desirability of substituting other food-stuffs for a portion of the oat-hay was emphasised. During the past months we have had the opportunity of examining many varieties of local-grown forage crops, and the results of our analyses should, I think, be of interest to all who are engaged in the care and feeding of stock.

Most of the analyses given in this paper were performed by the Assistant Chemist of this Department, Mr. R. D. Watt, B.Sc. Before giving the analytical figures it may be well to recapitulate the conditions with which the ration of an animal should comply. These are :—

1. It should contain protein, carbohydrates and fat in suitable proportion for the requirements of the animal. These requirements differ somewhat according to the age, kind of animals, conditions under which they are kept, and other circumstances. The relation between the amounts of protein on the one hand, and of carbohydrates and fat on the other, is most conveniently expressed by what is known as the "nutritive ratio" or "albuminoid ratio" of the food.

   The method of calculating this ratio is explained at length in this "Journal," Vol. IV. (July, 1906), p. 816. So also the most suitable albuminoid ratios for the food of various animals were given in the last number of the "Journal," Vol. V. (July, 1907), p. 926.

* Vol. V. (April, 1907), pp. 647 to 656, and (July, 1907) pp. 925 to 932.

2. It should contain in proper quantity, and especially *in proper proportions*, the various mineral ingredients required for the nutrition and formation of bone, and for the carrying on of the various life processes of the animal. The relative proportions of lime and phosphoric acid are probably of the greatest importance in this connection.

In previous articles, however, I have dealt with this point at some length. (Vol. V., April, 1907, p. 647.)

It will be convenient to classify the forage crops examined into groups :—

Group I.—Green immature forage crops (available chiefly as pasturage or for soiling).

Group II.—Cereal hays, etc.

Group III.—Leguminous hays, etc.

Group IV.—Roots.

Group V.—Straw, stalks, etc., after removal of seeds.

In the tables which follow are given the composition of the various products, in the case of Groups I. and IV., in their original moist condition ; in the case of the other substances, in the ordinary air-dry state.

With regard to the various constituents determined, the following points are to be noted :—

Protein.—This is the product of the total nitrogen present multiplied by 6.25, and is not necessarily a correct measure of the proteids, since a portion of the nitrogen in most vegetable substances exists in other forms than albuminoids or proteids. Amides, which possess much less feeding value than true albuminoids and nitrates, which probably possess no value as foods, are present in many materials and yield nitrogen on analysis. The amount of "protein," therefore, is, in all cases, probably too high, and especially is this the case with roots.

Crude Fibre.—This is a purely conventional item, and gives the proportion of the material which resists the effect of boiling, first with dilute sulphuric acid, and then with dilute caustic soda and washing with alcohol and ether. It is certainly erroneous to assume, as is often done, that this constituent is incapable of being digested by animals. Ruminants, in particular, are able to digest and utilise large proportions of the "crude fibre" of many forage plants.

In calculating the albuminoid ratio it is usual to ignore the "crude fibre," consequently the ratio so calculated is, in many cases, "narrower" than the true albuminoid ratio.

As already explained, in calculating albuminoid ratios, *digestible* constituents should be considered, but as the digestibility is imperfectly known and varies considerably, both with the particular animals in

question and even with different individuals of the same kind of animal, it is difficult to obtain the data to calculate the proper albuminoid ratio.

Consequently, in the albuminoid ratios given in the tables, the *total* constituents, not the *digestible* ones, have been used. In the first line for albuminoid ratio are given the figures calculated in the conventional way, without reference to the crude fibre, and on the assumption that the "ether extract" has, like true fat, about 2½ times the value of starch.

In the second line an "amended" albuminoid ratio, calculated by taking the ratio of the protein to the sum of the values for "soluble carbohydrates," "crude fibre," and "ether extract," is given. The actual effective albuminoid ratio for feeding purposes probably lies between the two values given.

Ether Extract.—This, as its name implies, is the proportion of matter extracted from the dried material by the action of ether. It includes true fat, resins, chlorophyll and other colouring substances, and, in the case of green fodder particularly, it would certainly be erroneous to consider it all fat and to assme that it had 2½ times the value of starch.

Consequently, the true albuminoid ratio of the various foods, in the absence of data concerning the proportion of actual albuminoids present and the digestibility of the different constituents, must remain somewhat uncertain, but the numbers given are probably comparable among themselves.

In the ash, four constituents were determined, viz., silica, potash, lime and phosphoric acid. Particular interest attaches to the two latter, and especially to the ratio between them. In the tables this ratio is given by the figures which represent the amount of lime present to 100 parts by weight of phosphorus pentoxide.

Group I.—Green Forage.

Cut in July or August, while very short: typical of pasturage plants.

Tall Fescue (*Festuca elatior*), grown at Skinner's Court, which had remained green through the winter in spite of drought and frost. Young shoots only.

Burnet (*Sanguisorba minor*), also from Skinner's Court, valued especially as a food for sheep. Young plants.

Sheep's Parsley (*Petroselinum sativum*), from Skinner's Court. Sample consisted of young plants.

Prickly Pear (*Opuntia ficus-indica*), from a garden in Pretoria; the "leaves" only were analysed.

Table I.

	Tall Fescue.	Burnet.	Sheep's Parsley.	Prickly Pear.
Moisture	60.69	61.56	75.83	93.79
Ash	4.08	3.59	3.19	1.13
Protein	5.90	5.64	5.43	0.42
Soluble carbohydrates	16.75	21.56	11.95	3.89
Ether extract ..	4.64	2.09	0.72	0.12
Crude fibre	7.94	5.56	2.88	0.65
	100.00	100.00	100.00	100.00
Albuminoid ratio (conventional) ..	1:4.8	1:4.7	1:2.5	1:10.0
Albuminoid ratio (suggested) ..	1:5.0	1:5.2	1:2.9	1:11.1
The ash included :—				
Silica	1.51	0.80	0.32	0.003
Potash	1.55	0.77	1.01	0.34
Lime	0.31	0.63	0.50	0.29
Phosphorus pentoxide	0.12	0.13	0.16	0.023
Ratio, 100 of phosphorus pentoxide to lime	258	485	312	1261

The high feeding value of tall fescue, burnet, and sheep's parsley, despite their succulence, is evident from the figures, while the extremely watery character of prickly pear "leaves" and their poverty in protein are remarkable. Nevertheless, after the prickles have been removed (which could be readily done by means of a painter's blast lamp, burning paraffin), prickly pear forms a refreshing food for cattle and sheep in the dry winter months. The juice is remarkably glutinous.

The three first-mentioned samples, after air-drying, were found to contain :—

Table II.

	Tall Fescue.	Burnet.	Sheep's Parsley.
Moisture	9.14	9.42	11.47
Ash	9.43	8.45	11.67
Protein	13.65	13.30	10.86
Soluble carbohydrates ..	38.70	50.80	43.79
Ether extract	10.72	4.93	2.65
Crude fibre	18.36	13.10	10.56
	100.00	100.00	100.00
The ash included :—			
Silica	3.65	1.90	1.17
Potash	3.59	1.83	3.67
Lime	0.72	1.48	1.82
Phosphorus pentoxide ..	0.28	0.31	0.58

This last table shows what the composition of hay made from these crops, when cut very green and young, would be.

Belonging to this group may be included three leguminous crops —vetches, blue lupines and white lupines—samples of which were received from Potchefstroom and had been cut green before flowering. They were, however, air-dried before analysis, and no direct determination of the amount of water present in them in their green state was made. The analytical figures obtained, however, show perfectly well the relative proportions of the various constituents. The amount of water present in the freshly cut green plants was probably about 60 to 70 per cent.

Table III.

	Vetches. (*Vicia villosa.*)	Blue Lupines. (*Lupinus angustifolius.*)	White Lupines. (*Lupinus albus.*)
Moisture	9.40	8.18	7.79
Ash	8.62	8.32	7.84
Protein	20.56	17.06	14.09
Soluble carbohydrates ..	35.88	41.72	50.10
Ether extract	4.01	2.68	2.75
Crude fibre	21.23	22.04	17.43
	100.00	100.00	100.00
Albuminoid ratio (conventional) ..	1:2.2	1:2.8	1:4.0
Albuminoid ratio (suggested) ..	1:3.0	1:3.8	1:5.0
The ash included :—			
Silica	0.89	0.40	0.90
Potash	4.74	1.41	2.82
Lime	0.88	3.83	0.91
Phosphorus pentoxide ..	0.67	0.65	0.43
Ratio, 100 of phosphorus pentoxide to lime ..	131	589	212

The high proportion of protein contained in these crops show how valuable they are for green manuring, containing, as they do, about 3% (of their air-dried weight) of nitrgoen.

Unfortunately, as food, lupines are not a great success, as they contain a bitter alkaloid which renders them distasteful to horses and cattle, and even sheep will only eat them under compulsion. Under certain conditions, too, they are said to be poisonous to sheep, though the poisonous properties may be destroyed by the action of high pressure steam.

Their chief use, therefore, will be for green manuring.

Group II.—Cereal Hays.

(*a*) Oat-hay (*Avena sativa*) of ordinary quality, from Potchefstroom.
(*b*) Boer manna hay (*Setaria italica*), grown on the Witwatersrand.
(*c*) Boer manna hay (*Setaria italica*), grown at Potchefstroom.
(*d*) Teff hay (*Eragrostis Abyssinica*), grown at Standerton.
(*e*) " " " " " Skinner's Court.

Table IV.

	Oat Hay.	Boer Manna.		Teff Grass.	
	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)
Moisture ..	8.00	8.25	6.54	8.88	9.16
Ash	4.23	7.78	6.06	5.55	6.71
Protein ..	5.65	5.00	4.90	6.21	4.72
Soluble carbohydrates ..	44.03	46.24	38.93	39.08	42.71
Ether extract ..	3.87	1.88	1.07	1.21	1.07
Crude fibre ..	34.22	30.85	42.50	39.07	35.63
	100.00	100.00	100.00	100.00	100.00
Albuminoid ratio (conventional)	1:9.4	1:10.1	1:8.5	1:6.8	1:9.6
Albuminoid ratio (suggested) ..	1:14.5	1:15.8	1:16.8	1:12.8	1:16.8
The ash included :—					
Silica	2.01	5.67	2.44	3.25	4.08
Potash ..	—	—	2.30	1.28	1.62
Lime	0.18	0.30	0.21	0.30	0.27
Phosphorus pentoxide ..	0.34	0.32	0.09	0.24	0.28
Ratio, 100 of phosphorus pentoxide to lime ..	53	94	217	125	96

The figures show that Boer manna and teff are liable to considerable variation in composition, as indeed are most crops. The poverty of oat-hay in lime, and its richness in phosphoric acid, to which I have so often referred, is well shown in the above analysis.

(*f*) Veld hay—mixed grasses, grown near Johannesburg.
(*g*) Sweet grass-hay—chiefly *Chloris virgata*, grown at Potchefstroom.
(*h*) Rhodes grass-hay (*Chloris guyana*), grown at Skinner's Court.
(*i*) Teosinte (*Euchlæna Mexicana*) hay, grown at Skinner's Court.
All these were actual hays, made and stacked.

Table V.

	(*f*) Veld Hay.	(*g*) Sweet Hay.	(*h*) Rhodes Grass.	(*i*) Teosinte.
Moisture	8.07	7.52	8.99	11.45
Ash	5.44	8.13	8.72	9.73
Protein	3.43	7.61	9.19	7.89
Soluble carbohydrates	43.84	37.57	29.27	38.02
Ether extract ..	1.21	1.04	1.35	1.52
Crude fibre	38.01	38.13	42.48	31.39
	100.00	100.00	100.00	100.00
Albuminoid ratio (conventional) ..	1:13.6	1:5.3	1:3.5	1:5.3
Albuminoid ratio (suggested) ..	1:24.2	1:10.1	1:8.0	1:9.0
The ash included :—				
Silica	4.07	3.44	4.00	3.25
Potash	0.59	2.57	1.15	4.10
Lime	0.32	0.25	0.60	0.59
Phosphorus pentoxide .	0.10	0.18	0.24	0.29
Ratio of 100 phosphorus pentoxide to lime	320	139	250	203

The poverty of veld hay in protein, the richness of its ash in silica, and its high ratio of lime to phosphoric acid are noticeable, as are also the large proportions of protein in Rhodes grass and teosinte, and their richness in ash constituents, particularly in lime.

These hays might, with great advantage, be used as substitutes for a portion of the oat-hay so largely employed in the feeding of horses and mules.

(*j*) Natal blue grass hay (*Andropogon hirtus*).
(*k*) Golden millet hay (*Setaria sp.*), grown at Skinner's Court.
(*l*) Californian green moha (*Setaria sp.*), „ „ „
(*m*) Japanese broom-corn millet (*Panicum crus-galli*), grown at Skinner's Court.

All these were samples of true hays from stacks.

Table VI.

	Blue Grass. (*j*)	Golden Millet. (*k*)	Green Moha. (*l*)	Broom Corn. (*m*)
Moisture	7.98	7.88	7.97	9.65
Ash	5.96	9.49	9.27	8.76
Protein	4.38	11.11	10.52	6.83
Soluble carbohydrates	41.87	29.54	35.62	38.84
Ether extract ..	1.31	0.95	1.22	1.16
Crude fibre	38.50	41.03	35.60	34.76
	100.00	100.00	100.00	100.00

Table VI.—(Continued.)

	Blue Grass. (*j*)	Golden Millet. (*k*)	Green Moha. (*l*)	Broom Corn. (*m*)
Albuminoid ratio (conventional) ..	1:10.2	1:2.9	1:3.7	1:6.1
Albuminoid ratio (suggested) ..	1:18.5	1:6.4	1:6.9	1:10.9
The ash included :—				
Silica	3.50	1.54	3.71	4.80
Potash	1.04	5.16	2.44	1.92
Lime	0.47	0.35	0.41	0.33
Phosphorus pentoxide	0.28	0.40	0.30	0.19
Ratio, 100 of phosphorus pentoxide to lime	168	88	137	174

The very high proportions of protein in golden millet and in green moha, and excessive amount of potash in the former are noteworthy. The golden millet is poor in lime and rich in phosphoric acid. Both these crops, when cut and made into hay, before ripening (as was the case with the samples examined), are evidently of high feeding value. They must be somewhat exhausting to the soil, especially robbing it of nitrogen and potash.

GROUP III.—LEGUMINOUS HAYS.

(*n*) Lucerne hay (*Medicago sativa*), grown and made at Potchefstroom.
(*o*) Cow-pea hay (*Vigna catjang*), grown and made at Skinner's Court.
(*p*) Cow-pea haulm (*Vigna catjang*), grown at Potchefstroom (somewhat too ripe, and without seed).
(*q*) Velvet bean hay (*Mucuna utilis*), from Pietpotgietersrust.
(*r*) Maple pea hay (*Pisum arvensis*), from Potchefstroom.

Table VII.

	Lucerne. (*n*)	Cow-pea. (*o*)	(*p*)	Velvet bean. (*q*)	Maple pea. (*r*)
Moisture	7.97	8.21	7.92	9.25	8.04
Ash	8.94	6.28	8.21	7.83	6.92
Protein	15.49	13.21	14.44	13.30	16.27
Soluble carbohydrates	30.58	39.59	30.74	39.44	35.25
Ether extract ..	2.26	2.40	1.24	2.55	2.36
Crude fibre	34.76	30.51	37.45	27.63	31.16
	100.00	100.00	100.00	100.00	100.00

Table VII.—(Continued.)

	Lucerne.	Cow-pea.		Velvet bean.	Maple pea.
	(*n*)	(*o*)	(*p*)	(*q*)	(*r*)
Albuminoid ratio (conventional) ..	1:2.3	1:3.4	1:2.3	1:3.4	1:2.5
Albuminoid ratio (suggested) ..	1:4.4	1:5.5	1:4.8	1:5.2	1:4.2
The ash included :—					
Silica	0.49	0.69	0.57	1.60	0.77
Potash	3.61	1.56	3.47	2.21	3.49
Lime	1.38	1.56	0.98	1.80	0.99
Phosphorous pentoxide ..	0.32	0.63	0.49	0.31	0.49
Ratio, 100 of phosphorus pentoxide to lime..	431	248	200	581	202

The richness in protein, potash and lime, and the poverty in silica so characteristic of leguminous plants is well shown in the above analyses.

The consequent high albuminoid ratio renders such crops very valuable for feeding purposes, especially as they can be used to reinforce a ration consisting largely of highly carbonaceous foods, *e.g.*, mealies, oat-hay, etc.

Cow-pea and velvet bean, particularly, if cut while still young, furnish hay greatly relished by stock, and containing but little woody fibre. Such hay would be an invaluable addition to the winter food of cattle, and an increased production of these crops is strongly to be recommended. The high proportion of lime to phosphoric acid in these materials is also of great importance, since, by the addition of leguminous hay to the rations of animals, the very defective lime content of oat-hay would be made good and the evil effects of a diet composed solely of cereals upon bone nutrition would be avoided.

In all crops to be cut for hay, care should be taken to avoid over-ripening, or the amount of "crude fibre" in the resulting hay becomes great and the product less palatable and digestible.

* * * *

Group IV.—Roots.

Only a few samples of roots have, so far, been examined in the Laboratories. They have consisted chiefly of beets, mangels and turnips.

Roots show enormous variation in composition, particularly in the amounts of carbohydrates present. Thus, in beets the quantity of sugar has been found to vary from 4 or 5 per cent. to as high as 17 or 18 per cent., while that of "crude protein" (*i.e.*, nitrogen $\times$ 6.25) from 1.0 per cent. to 2.04 per cent. As already stated, these figures do not really represent the amount of albuminoids present as amides and nitrates account for a large portion of the nitrogen.

The following analyses may be quoted :—

Swedes (variety unknown), grown near Johannesburg. Average weight per root = 3 lbs. 9 ozs.

Water	90.5 per cent.
Dry matter	9.5 „
	100.0 „
Ash	1.49 „
Protein	2.04 „

The ash contained 0.095 of lime.
0.097 of phosphorus pentoxide.

Long Red Mangels, grown near Johannesburg. Average weight per root = 3 lbs. 8 ozs.

Water	89.12 per cent.
Dry matter	10.88 „
	100.00 „
Ash	1.29 „
Protein	1.36 „

The ash contained 0.024 per cent. of lime.
0.032 per cent. of phosphorus pentoxide.

Golden Globe Mangels, from near Johannesburg. Average weight per root = 3 lbs. 5 ozs.

Water	91.89 per cent.
Dry matter	8.11 „
	100.00 „
Ash	1.74 „
Protein	1.53 „

This sample is remarkable for its poverty in dry matter.

Sugar Beets.—From Experimental Farm, Potchefstroom.

Variety : *White French.* Average weight per root = 2 lbs. 1 oz.

Water	78.63 per cent.
Dry matter	21.37 „
	100.00 „
Ash	1.29 „
Sugar	12.91 „

Variety : *Vilmorin White.* Average weight per root = 2 lbs. 6 ozs.

Water	80.63	per cent.
Dry matter	19.37	,,
	100.00	,,
Ash	1.17	,,
Sugar	11.42	,,

Variety : *Klein Wanzlebener.* Average weight per root = 2 lbs. 8 ozs.

Water	77.97	per cent.
Dry matter	22.03	,,
	100.00	,,
Ash	1.07	,,
Sugar	14.57	,,

The leaves from the "White French" sugar beets were also analysed.

They contained :—

Water	82.59	per cent.
Ash	3.45	,,
Protein	3.57	,,
Fibre, fat and carbohydrates	10.39	,,
	100.00	,,

Two other samples of sugar beets from Haaskraal, near Potchefstroom were also examined.

Sample 1. ; no name given. Average weight per root = 1 lb. 3 ozs.

Water	75.5	per cent.
Dry matter	24.5	,,
	100.0	,,
Protein	1.93	,,
Sugar	17.8	,,

Sample II., labelled "French White Vilmorin." Average weight per root = 1 lb. 2 ozs.

Water	75.84	per cent.
Dry matter	24.16	,,
	100.00	,,
Protein	2.01	,,
Sugar	17.8	,,

The higher sugar content of the small sugar beets is, as usual, very marked.

The amount of lime present in roots is apparently very small and less than that of phosphoric acid, so that they afford little help in bone nutrition.

* * * *

GROUP V.—STRAW, etc., after removal of seeds.

(*a*) Mealie stalks, grown near Johannesburg.
(*b*) Mealie stalks, grown at Potchefstroom.
(*c*) Kaffir corn stalks, grown at Potchefstroom.
(*d*) Sorghum stalks, ,, ,,
(*e*) Millet stalks, ,, ,,
(*f*) Oat straw, ,, ,,
(*g*) Wheat straw, ,, ,,

Table VIII.

	Mealie stalks.		Kaffir Corn.	Sorghum.	Millet.	Oats.	Wheat.
	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)
Moisture	9.52	7.30	10.35	8.50	7.56	6.45	6.70
Ash	5.49	4.91	6.19	4.33	6.42	6.45	6.07
Protein	4.46	4.46	4.81	5.10	5.34	4.20	3.85
Soluble carbohydrates	37.73	41.12	40.29	39.16	38.68	45.23	39.67
Ether extract ...	1.75	1.16	1.36	1.94	1.04	2.18	1.75
Crude fibre	41.05	41.05	37.00	40.97	40.96	35.49	41.86
	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Albuminoid ratio (conventional) ...	1:9.4	1:9.8	1:9.1	1:8.6	1:7.7	1:12.1	1:11.4
Albuminoid ratio (suggested)	1:18.0	1:18.7	1:16.3	1:16.1	1:15.1	1:19.7	1:21.7
The ash included :—							
Silica	1.83	1.82	3.51	1.66	1.34	2.03	3.76
Potash...	2.06	1.41	1.59	1.42	2.91	2.86	2.10
Lime	0.23	0.18	0.23	0.20	0.22	0.23	0.16
Phosphorus pentoxide	0.13	0.19	0.23	0.28	0.33	0.11	0.06
Ratio, 100 of phosphorus pentoxide to lime ...	177	95	100	71	67	209	250

The figures show that the straw of cereals is, as a rule, low in protein and high in crude fibre and ash, and that the proportion of lime to phosphoric acid is much higher than in the seeds of the same plant. The albuminoid ratio of the straw is low in all cases, and as food for most animals, is too "wide" for proper nourishment. Except, therefore, for special purposes, *e.g.*, the maintenance ration for resting oxen, a diet of straw alone is not suitable; additions of some more nitrogenous food-stuff would be required in order to "narrow" the albuminoid ratio.

Comparative Value of Various Fodders.

In the "Journal" for July, 1906 (Vol. IV., p. 818), a method of calculating the approximate money value of food-stuffs from their chemical composition was described and illustrated by examples. As there stated, such a method has no claim to accuracy, since so many factors (*e.g.*, digestibility, palatability, possible medicinal action and others) are not capable of being expressed quantitatively. Moreover, with many of the food-stuffs given in this paper containing large quantities of "crude fibre," some of which is digestible, and, therefore, possessed of feeding value, it would probably be unfair to ignore the "crude fibre."

Perhaps a fair way of calculating comparative values would be to take protein as 2½ times the value of carbohydrates, ether extract (since it is obviously not all fat) as being equal to carbohydrates, and "crude fibre" as possessing half the value of carbohydrates.

Making these assumptions, the following list represents the relative value for feeding purposes of the various materials :—

			Per Ton.		
Maple pea hay	93.86,	or at 2s. per "unit" =	£9	7	8
Cow-pea hay (sample "o")	90.27	,, ,, ,,	9	0	6
,, ,, (sample "p")	86.80	,, ,, ,,	8	13	6
Velvet bean hay	89.05	,, ,, ,,	8	18	1
Lucerne hay	88.95	,, ,, ,,	8	18	0
Californian green moha ..	80.94	,, ,, ,,	8	1	10
Oat-hay	79.13	,, ,, ,,	7	18	3
Golden millet hay	78.78	,, ,, ,,	7	17	6
Sweet grass hay	75.70	,, ,, ,,	7	11	5
Oat-straw	75.65	,, ,, ,,	7	11	4
Teff (sample "d") ..	75.35	,, ,, ,,	7	10	7
,, (sample "e") ..	73.40	,, ,, ,,	7	6	9
Teosinte hay	74.96	,, ,, ,,	7	9	11
Rhodes grass hay	74.83	,, ,, ,,	7	9	8
Japanese broom-corn millet hay	74.45	,, ,, ,,	7	8	10
Sorghum stalks	74.33	,, ,, ,,	7	8	8
Mealie stalks (sample "b")	73.95	,, ,, ,,	7	7	11
,, ,, (sample "a")	71.15	,, ,, ,,	7	2	4

		Per Ton.
Millet stalks	73.55, or at 2s. per "unit" =	£7 7 1
Boer manna hay	73.50 „ „ „	7 7 0
Blue grass hay	73.38 „ „ „	7 6 9
Veld hay	72.63 „ „ „	7 5 3
Kaffir corn stalks	72.17 „ „ „	7 4 4
Wheat straw	72.00 „ „ „	7 4 0
	Green Materials.	
Burnet	40.53 „ „ „	4 1 1
Tall Fescue	40.11 „ „ „	4 0 3
Sheep's parsley	27.68 „ „ „	2 15 5
Prickly pear	5.38 „ „ „	0 10 9
	Young Plants, Air-Dried.	
Vetches	102.05 „ „ „	10 4 1
Blue lupins	98.07 „ „ „	9 16 1
White lupins	96.79 „ „ „	9 13 6

I repeat that the above figures must not be taken literally since so many circumstances have been ignored, but if the various materials were equally readily eaten by animals, were equally digestible, and had no harmful effect, the figures given would approximately represent their feeding value.

In practice, of course, such values would not be obtainable in the market, *e.g.*, veld hay, wheat straw and others are not worth the value assigned to them in the table, chiefly because of their lack of palatability and probable low digestibility. So also the lupins, which are shown as of such high value, do not merit it because of the bitter substances they contain and the actual poisonous effects they sometimes produce upon animals.

* * * *

I have repeatedly expressed the opinion that the usual food of horses and mules in this country, viz., oat-hay, or oat-hay and mealies is not suited to the requirements of working animals, and is probably responsible for many troubles in the way of diseases among these animals.

The analyses in this paper show, I think, that there is an ample choice of fodder crops, many of which are fitted by chemical composition to supply in far better measure than oat-hay the requirements of animals. Some of these, *e.g.*, lucerne, cow-peas, velvet beans, and certain millets can readily be grown here and give very remunerative yields.

I feel fully convinced that a partial replacement of the oat-hay by other fodders would be extremely beneficial and profitable, and I would strongly urge the stock-farmer to endeavour to feed his animals upon a more varied diet than the one which is so generally employed at present.

In conclusion, I desire to express my thanks to the members of the staff of this Division for assistance in the analytical work recorded in this paper, and also to the Division of Botany and the Managers of the Experimental Farms at Potchéfstroom and Standerton for samples of various food-stuffs. We are also indebted to certain correspondents outside the Department of Agriculture for their kind assistance in supplying similar samples.

No. 2.]

NOTES FROM THE CHEMICAL LABORATORIES.

The Rapidity of Decay of Organic Matter in Our Soil.

Organic matter appears to decay far more rapidly in the soils of this country than in those of Europe. This is doubtless due to the higher temperature prevailing here, and probably to the open, porous character of many of our soils after they have once been broken up. That destruction of vegetable organic matter occurs so rapidly is the main reason that our soils are so generally deficient in humus despite the luxuriant growth of vegetation on them during the wet season. The disappearance of the organic matter is, in many cases, aided by other agencies than decay, foremost among these being the effects of white ants and the practice of veld-burning.

This rapid disappearance of organic matter from our soil is evident to ordinary observation, but we have had several instances where it has been rendered strikingly evident.

Thus, in September, 1905, six samples of material from a slaughter house refuse and general depositing site near Johannesburg were sent for analysis, with a view of determining their manurial value.

These samples were labelled as follows :—

(*a*) "Urine."
(*b*) Between urine and top.
(*c*) Blood.
(*d*) Two-and-a-half-years old.
(*e*) Hole No. 1.
(*f*) Hole No. 2.

The ground had apparently been used for the disposal of slaughter house offal and of bucket refuse. The samples were examined for their content of nitrogen, potash and phosphoric acid.

The results were as follows :—

	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)
Nitrogen	0.116	0.146	0.099	0.267	0.077	0.125
Potash	0.19	0.39	0.27	0.30	0.20	0.20
Phosphorus pentoxide ..	0.35	0.19	0.13	0.28	0.12	0.11

The manurial constituents are thus extremely small, the nitrogen in particular being unexpectedly low, the only constituent which had accumulated to any extent being the phosphoric acid, which was, on the average, about 3 or 4 times as much as one usually finds in a virgin soil of this character.

Again, in May last, I received a sample from the town depositing site of Barberton. The material was apparently a sandy soil and yielded the following figures on analysis :—

	Per cent.
Moisture	1.58
*Loss on ignition (organic matter, etc.) ..	12.03
Insoluble matter (sand, etc.)	70.41
Iron oxide and alumina	11.08
Lime	2.93
Magnesia	0.53
Potash	0.69
Phosphorus pentoxide	0.50
Carbon dioxide	0.19
	99.94

* Containing nitrogen, 0.488.

This deposit, though richer in nitrogen than the above-mentioned samples, is but poor in plant food, and its composition clearly indicates that the large quantities of organic matter deposited on the site for many years past must, to a great extent, have been dissipated. The phosphoric acid and potash, however, have evidently accumulated.

Another sample from the same site received in August was much poorer in manurial ingredients. In it were found :—

	Per cent.
Moisture	4.99
*Loss on ignition (organic matter, etc.) ..	6.72
Insoluble matter (sand, etc.)	73.96
Iron oxide and alumina	11.53
Lime	0.45
Magnesia	0.12
Potash	0.49
Phosphorus pentoxide	0.17
	98.43

* Containing nitrogen, 0.159.

This, indeed, represents little more than an average soil excepting that the nitrogen and phosphoric acid are slightly higher than one usually finds.

As I stated in my reports, these deposits, if they could be cultivated *in situ*, might be valuable, but the quantities of plant food present in them are too small to pay for their transport to any distance for use as manures.

Their poverty in nitrogen affords strong confirmation of the rapidity with which organic nitrogenous matter decays when mixed with soil.

* * * *

COMPOSITION OF "JOEGEE BEANS."

A sample of seeds under this name was sent by a correspondent from the Waterberg District, with the information that they were produced by a wild plant which ripens its seed in June. He was in hopes that the beans might serve as a source of oil. The seeds were identified by the Division of Botany as those of *Voandzeia subterranea*, known under the names "Kaffir ground nuts," "Bambarra ground nuts," and others.

In habit of growth and method of ripening the seeds underground, the plant resembles the pea nut, "*Arachis hypogoea*," but as the analysis shows, the seeds differ widely in composition. The following are our analytical results :—

100 seeds weighed 83.03 grammes.

1 lb. therefore contains 550 "nuts."

	Per cent.
Percentage of husks	21.8
Percentage of kernels	78.2
	100.0

The kernels contained—

Moisture	7.02
Ash	3.70
Protein	16.63
Fat	8.18
Crude fibre	6.14
Soluble carbohydrates	58.33
	100.00

The above results agree fairly well with other published analyses. Thus, Balland found in seeds from the French Congo :

	Per cent.
Moisture	9.8
Ash	3.3
Protein	18.6
Fat	6.0
Crude fibre	4.0
Soluble carbohydrates	58.3
	100.0

The main differences are that the Waterberg product was richer in fat, crude fibre and ash, but lower in moisture and protein.

The figures show the seeds to contain but little oil, and I do not think it would be practicable to profitably extract the oil from them.

Their composition, however, indicates that they possess high feeding value, though it is said that, unless boiled, their use in large quantities as human food gives rise to headache and other troubles.

The ash of the Waterberg "beans" included :—

	Per cent.
Insoluble matter (silica, etc.) ..	0.31
Lime	0.06
Potash	1.68
Phosphorus pentoxide	0.51

The beans, if producible in quantity, might with advantage be used as cattle food.

THE BOTANICAL SECTION.

NOTES ON EXPERIMENTS CARRIED OUT AT THE SKINNER'S COURT EXPERIMENT STATION, PRETORIA, 1906-07.

By H. Godfrey Mundy, P.A.S.I.,
Assistant for Seed and Plant Experiments.

Castor Oil.

The results obtained in these trials were not very satisfactory. A considerable number of the trees planted in 1905 were killed by frost during the winter, and the blanks were filled up in September, 1906.

Large Black Castor Bean (*Ricinus zanzibarensis nigricans*) were all sown on September 24th, 1906; on the whole the trees made good growth, but at least 20% of them bore no fruit. The soil was a poor red loam, which had not been cultivated for two years or more, and on which castor oil plants had been grown the previous year. The total weight of seed given by 133 trees was 83 lbs., which, allowing for the 20% of trees which did not bear, gives an average yield of rather less than 1 lb. per tree.

The best yields recorded ranged from 1¼ to 4 lbs. per individual tree; from thirteen of the best yielding trees the average was 2 lbs.

Large Red Variety.—Ten trees, of these six were planted in 1905, and four were 1906 seedlings.

The total yield was 9½ lbs., the best individual yield being 2 lbs. 2 ozs.

Small Seeded Varieties.

Ricinus Philippinus.—Forty-three trees gave a total yield of 25 lbs., the highest individual yield being 1½ lbs. Owing to the readiness with which these varieties shed their seed, much difficulty is experienced in stating an actual yield per tree. This fact also adds considerably to the difficulty of harvesting the crop, as it is necessary to pick up the shed beans from the ground.

Ricinus sanguineus.—Nineteen trees yielded 11 lbs. of beans, the best individual yield being 1 lb. The same remarks about shedding seed apply to this variety also, but in a lesser degree.

Conclusions.—The large seeded varieties give a heavier yield per tree, and are more easy to handle, owing to the fact that they do not shed their seed as readily as do the smaller varieties. Planted 8 × 8 feet there would be 680 trees to the acre and planted 10 × 10 feet there would be 435 trees; thus it will be seen that at the closer sowing, and taking the actual yield given by the black castor bean a crop of 415 lbs. odd of seed would have been reaped, or just over two bags per acre, while, taking the average of the best thirteen trees, namely, 2 lbs.

each, the crop would approach 7 bags per acre of beans. It must, however, be remembered that the climate of Pretoria is not sufficiently warm, nor the growing season sufficiently long, for successful cultivation of castor oil as a marketable crop. Further, it is probable that the second year each tree would materially increase its yield, and would be at least a fortnight earlier in maturing seed.

Further extensive trials will be carried out this year on a larger scale, and we shall then be able to speak more definitely on castor oil bush cultivation in the Transvaal.

Leguminous Crops for Hay, Ensilage, Soiling or Green Manure.

Velvet Beans.—A plot equal to one-tenth of an acre in area was sown under this crop on November 17th, 1906. The soil was a rich, black turf, somewhat inclined to be water-logged after excessive rains. The crop was reaped on March 21st, and gave 6¼ tons of green fodder per acre. This was an unsatisfactory yield, and may be accounted for by the fact that the soil was unsuitable ; probably it would have done better on a warm, red loam. The Velvet Bean, however, is not too well suited to the High Veld, and the best results may be expected when it is sown in the warmer districts of the Middle Veld.

Kaffir Beans.—Sown on the same date, and under the same conditions ; yielded green fodder at the rate of 11½ tons per acre which, on being converted into hay, dried out two-thirds, giving a yield of hay of about 3¾ tons per acre.

This crop is less sensitive than the Velvet Bean, and is better adapted to the conditions of the High Veld, where it will be found most valuable for hay or green manure.

Scarlet Vetch.—Was grown on a 1-20th acre plot to test its value as a summer hay crop or for green soiling. Planted on black turf land it made an excellent growth, reaching upwards of 3 feet in height. Sown on November 17th it was cut on March 21st, and yielded approximately 10½ tons of green fodder per acre.

Soybeans.—Would have been most successful but for the advent of locusts, which appear to have a considerable liking for Soybeans. The crop was sown on November 17th, and by the first week in March was standing about 2 feet 6 inches to 3 feet high, and in full flower ; beans set in enormous quantities, but just then the locusts descended and cleaned off the crop. The yield of green fodder at the time the crop was ready to cut for hay was estimated at 15 tons per acre.

A photograph of this plot is shown in the "Agricultural Journal," No. 19, April, 1907, Plate CLXXXVII.

Ensilage Crops.

A series of experiments were carried out with a view to ascertaining what crops are likely to give the highest yield of green fodder

per acre for converting into ensilage, and further, whether it is profitable to sow leguminous plants between the rows of the main crop or not.

The crops rich in carbohydrates which were sown were :—Mealies, Sorghum, Pearl Millet and Teosinte, and the comparative merits of Kaffir bean and Velvet bean when sown between each of the above-named crops was tested. Twelve plots of 1-40th acre each were laid out on a rich black turf soil to which no manure had been applied. All the sowings were made on November 26th, 1906. The main crops were drilled, and the leguminous crops drilled in between the rows. Owing to the favourable season good and rapid growth was made even on the mixed plots since, owing to the excessive rainfall, there was ample moisture for both crops.

Where mealies were sown, Natal White Horsetooth was the variety used. The crops were cut on March 11th, 1907 ; the average height of the mealies was then about 10 feet, Sorghum and Pearl Millet 8½ to 9 feet and Teosinte about 4½ feet.

In the case of Teosinte this should have been allowed another month or two to grow, and it would then have probably given the heaviest yield recorded.

The following table shows the weights per acre immediately after cutting, also the distance apart of planting, etc. :—

EXPERIMENTS WITH PURE AND MIXED CROPS FOR ENSILAGE.

Plot No.	Name of Crop.	Date of sowing.	Distance apart in feet of the main crop.	Harvested.	Yield per acre stated in Colonial tons.
1	Mealies (Natal White Horsetooth) alone	Nov. 26	2½ × 2	Mar. 11	30½
1a	Mealies and Kaffir beans ...	"	3½ × 3	"	29¼
1b	Mealies and Velvet beans ...	"	3½ × 3	"	22
2	Sorghum alone	"	2½ × 1	"	18¼
2a	Sorghum and Kaffir beans ...	"	3½ × 2	"	23
2b	Sorghum and Velvet beans ...	"	3½ × 2	"	19¼
3	Pearl Millet alone	"	2½ × 10″	"	20½
3a	Pearl Millet and Kaffir beans ...	"	2½ × 2	"	15
3b	Pearl Millet and Velvet beans ...	"	2½ × 2	"	15¼
4	Teosinte alone	"	3 × 3	"	25
4a	Teosinte and Kaffir beans ...	"	3½ × 3½	"	21
4b	Teosinte and Velvet beans ...	"	3½ × 3½	"	18

It will be seen that with the exception of the Sorghum plot all crops have given a better yield when sown alone than when a leguminous crop was planted between the rows, and this in a year when exceptionally good rains were experienced. It is probable, therefore, that had the rainfall been scanty, as in previous years, the advantage in favour of pure crops would have been even more marked.

As has been previously pointed out, Teosinte was not full grown when cut, and if it had been allowed another month's growth the yield would have been materially increased.

Conclusions.—On the whole it seems that throughout the High Veld districts mealies will give the heaviest yield of green fodder per acre, but where sowing has been postponed till late in the season, and a quick growing crop is required, either Pearl Millet or Sorghum may have a decided advantage. For the Middle and Low Veld, where a long growing period is obtainable, Teosinte will be found to give the best yield.

Kaffir beans appear to give a considerably heavier yield on the High Veld than do Velvet beans, but in the warmer districts this order will probably be reversed. Finally, where sufficient ground is available, it seems likely that pure crops will give better yields, and will be less risky than mixed ensilage crops, more especially so where the land is not rich and an ample rainfall sufficient for both crops is not assured. When it is desired to clean the land by means of a smother crop, and at the same time enrich the soil in nitrogenous matter, the addition of leguminous crops between the rows may recommend itself.

* * * *

Irrigated Lucerne.

Four full cuttings were obtained from the irrigated lucerne, the crop being cut on the following dates : November 1st, December 3rd, January 23rd, and February 28th ; the average weight of these was 4 tons of green fodder per acre, the best growth being made during December, when the weight of crop green per acre was 5½ tons. A light cutting was taken during October, but this was not weighed. Locusts partially destroyed the March crop, and entirely accounted for what growth was made during April. Trials have now extended over a series of three years, and it has been shown that in the process of conversion in hay, lucerne loses 2-3rds of its weight, therefore the average yield of hay for the four weighed cuttings may be reckoned as 1 1-3rd tons per acre. In addition to the above cuttings a considerable amount of grazing was obtained during May, June and the first half of July.

* * * *

Dry Land Lucerne.

Owing to good rains throughout the summer, this lucerne made steady progress. A light cutting was taken off during the early part of October, but was not weighed. In November the crop was severely

Plate 6.

A Corner in the Seed Store.

Transvaal Department of Agriculture.

attacked by lucerne caterpillar, and was therefore cut on November 26th. The average yield over eight 1-20th acre plots was at the rate of one ton of green fodder per acre. On January 15th the crop was again cut ; this time it had not suffered from caterpillar, and the average yield over 15 plots was rather more than half a ton of hay per acre ; the best plot giving slightly less than one ton of hay to the acre. A third cutting was made on February 16th ; here again the average yield per acre from eleven plots was slightly above half a ton of hay, the best individual yield being given by a plot of Provence lucerne, which yielded at the rate of one ton of hay to the acre.

Good growth was again made during March, but this was entirely destroyed by locusts, and a further growth in April met the same fate.

Several of the above plots gave very poor returns owing to various causes ; two of the plots are on unsuitable soil, and on two others weeds are allowed to do their worst, with the result that very small cuttings are obtained. This year's trials have fully demonstrated the advantages of cultivating the crop once or twice during the summer ; an ordinary spring toothed cultivator is used, and has the effect not only of keeping down the weeds but, by loosening the surface of the soil, rain water is enabled to enter more readily, and during dry spells evaporation of soil moisture is to a large degree checked.

* * * *

Winter Pasture Plants and Grasses.

This winter has proved one of the severest trials that the introduced winter pasture plants have yet been put to. As has been previously pointed out, the Experiment Station was twice visited by locusts during the summer ; a third swarm appeared about the first week in May, and remained with us for several days. As a result of this all the plots of winter grasses were eaten bare, with two notable exceptions, namely, Tall fescue and Burnet. The former was left entirely untouched, although a plot of Reed fescue standing next to it was eaten to the ground, while the latter was only slightly damaged and quickly made new growth. In spite of all this, on July 6th, about six weeks after the last attack of locusts, the following grasses had made strong new growth, and were quite green :—Tall fescue, Reed fescue, Burnet, Sheep's Parsley, Flaxmere Rye grass, Perennial Rye grass, Canterbury Rye grass, while Sainfoin, Sulla, Rescue grass and New South Wales Blue grass were just greening, but making somewhat slow growth.

On August 1st the following changes had taken place :—Flaxmere Rye grass, Perennial Rye grass and Canterbury Rye grass had all suffered severely from drought, and were useless for grazing, but Sulla, Sainfoin, Rescue grass and New South Wales Blue grass had continued to make good progress, and would now have supplied a certain amount of "feed," while Burnet, Tall fescue, Reed fescue and Sheep's Parsley were quite green, and growing both strongly and rapidly.

The plot of Tall fescue which had been untouched by locusts was kept eaten down by horses all this time, and was found to make sufficient growth to allow of its being grazed every three weeks. Burnet was also grazed down, but appeared to grow rather more slowly, and required about a month before it was ready to feed off again.

* * * *

New Varieties Tested.

Three new Vetches were experimented with to test their value as winter pasture plants ; they were *Lathyrus silvestris*, *Lathyrus bicera* and Ervum or Bitter vetch. On June 6th these were all standing the drought and frost well, *Lathyrus bicera* making a very luxuriant growth, but by August 1st hot sun and drought had greatly damaged the first two, though the Bitter vetch was still growing well, quite green and in full flower.

* * * *

Autumn Sown Vetches.

A further experiment was planned with the view to testing the comparative merits of the Common vetch (*Vicia sativa*), Hairy vetch (*Vicia villosa*) and Scarlet vetch (*Vicia fulgens*). It was intended that these should be sown in late autumn, just before the last rains ; unfortunately sowing was delayed and no rains fell after the seed was in the ground.

Sowing took place on April 23rd, but when the plants were about two inches high, the whole stand was entirely cleaned off by locusts. Water was applied two days later, and since then the crop has received no irrigation. The soil is a dry red, sandy loam. By August 1st, the Scarlet vetch had made a very fair stand, and was providing a considerable amount of grazing. The Common vetch had practically failed, and the Hairy vetch was making such slow growth that no bite could have been obtained from it. It seems probable that had these sowings been made one month earlier, so that the crops would have had the benefit of the last autumn rains, Scarlet vetch would have given good grazing for sheep throughout August and September.

* * * *

Experiments with Pea Nuts (*Arachis hypogoea*) at the Springbok Flats Experiment Station, 1906-07.

Two varieties were grown, the Mammoth Virginian Pea Nut from directly imported seed, and the Spanish Pea Nut from locally grown seed. Both were sown in half-acre adjoining plots on a warm, red, sandy soil, and no manure was applied.

Mammoth Virginian was grown on the flat, and had no attention, with the exception of one hoeing to keep down weeds. The yield from the half acre was 309 lbs., or at the rate of 618 lbs. per acre. A bushel of Pea nuts weighs 22 lbs., therefore the yield stated in bushels was 28, as compared with an average American yield on good land and with careful cultivation of 30 to 60 bushels per acre.

Spanish Pea Nut.—Sown on a half-acre plot; same conditions as the above. Half the crop was left to grow on the flat, the other half was twice hilled up during the time the plants were in flower. Yield at the rate of 350 lbs., or 10 bushels per acre. The quarter-acre plot, which was hilled up, gave an increased yield of one bushel over the plot which was not hilled, or an increase of four bushels per acre.

This trial brings out the advantage in yield given by the Virginian Mammoth Pea nut, while chemical analysis by the Chief Chemist proves it to be very rich in oil. It seems probable that had the land been manured, and had the crop been properly hilled up, the yield per acre would have come very near the average American yield.

Report on Winter Pasture Plants and Grasses, Seed of which was Supplied by the Department to Mr. W. Guthrie, Standerton District.

"I herewith send report of Grass seeds received by me and planted for the purpose of experiment.

"I am sorry to say I was rather late in planting; I did not plant until 10th of December, and what grasses did come to seed were caught by frost.

"*Tall fescue.*—This grass did really well. It came up well; I sowed it broadcast a little thicker than forage, and mixed the seed with sand. In appearance it is coarse. A heavy stooler, grows to the height of eight inches. Frost has no effect on it, and it is just as green now as in summer, and still growing; a quick grower.

"*Flaxmere rye.*—This grass also did well; I also sowed it broadcast about the same thickness as oats. It grew well and quickly to the height of 3 feet. It had heavy ears, which bent over with weight. It has abundance of undergrowth as well as heads, but these latter did not fill owing to frost; the undergrowth stands the frost, and is still growing. Will do well on the High Veld.

"*Paspalum dilatatum.*—This grass I sowed in drills eighteen inches apart, and sowed it a little thinner than turnips. It took five weeks to come up in moist ground. Grows very slowly, stools well, very coarse. Stock are very fond of it. It won't stand the frost, and is now fairly dried up, but the roots are fresh, and no doubt it will spring up in the spring again. It won't do for the High Veld.

"*Cow grass.*—This grass I sowed in drills eighteen inches apart. It came up well, and is standing about seven inches in height and very tufty. I notice it prefers moist and sandy ground. It has not flowered until now, but the frost has no effect on it.

"*Rescue grass.*—This grass did splendidly. It was sown broadcast about the same thickness as Fescue. It grew to the height of six inches; a very dark silvery green colour. It grew so thick and heavy that it fell flat on the ground. I let a few of the farmers round here

see it, and they said that it reminded them of a meadow at Home. The frost has not the slightest effect on it ; it will do well on the High Veld.

"*New South Wales Blue grass.*—This grass never came up, and the seed must have been bad."

* * * *

On Sunflower Seed.

The following letter enquiring for sunflower seed has been received by the Division of Botany, and will be of interest to "Journal" readers :—

We beg to acknowledge receipt of your favour of the 12th, together with the sample of sunflower seed, which we consider to be of fine quality, and we trust you will be able to produce it so as to be able to compete with other countries.

2. We are sending you very small samples of what we are offered from Cincinnati, and also of what we have recently bought of Russian produce. We are offered the Cinninnati parcel at 13s. 6d. per cwt. c.i.f. London, and the Russian we bought at 11s. As no doubt you are aware the "c.i.f." means the *cost*, *insurance* and *freight* paid to London. We do not know what the freight would be from Durban, but as sunflower seed is bulky and takes up a lot of space we fear the freight would be rather heavy, as it is generally charged according to the cubic space. Of course, the prices of sunflower vary according to the seasons ; some years we are able to buy Russian as low as 9s. per cwt., and other years we have paid as much as 14s.

3. We are sorry that you do not give us any idea as to the quantity you can offer at present, but, in order to encourage business all we can, we would take 10 to 20 tons at £11 per ton *c.i.f. London*. We expect you will not have much difficulty in finding out what the freight from Durban to London is.

4. Would it not be possible to grow black and white sunflower, as well as the small striped, like the sample you send, as we must have a variety of colours for our trade, and the total of the different varieties we use is from 400 to 500 tons a year, and naturally we should like to do the business with our Colonies, if possible. We shall be pleased to hear what you think of our offer, and beg to thank you for having written us and for the sample.—Yours faithfully,

SPRATT'S PATENT, LTD.,

* * * *

One of our correspondents writes from the South Western Transvaal :—

"Out of the seeds sent me the only thing which has done well is the Sheep's Burnet. I noticed this was doing well, and in order to test its value gave it the roughest possible treatment. Several of our settlers got the seed to test, and you will be glad to hear that we are so pleased with it that we are importing one ton of it from France. Burnet seems to do best on a sandy soil."

THE HORTICULTURAL SECTION.

HORTICULTURAL USES OF EXPERIMENTAL FARMS.

By R. A. Davis (Horticulturist).

Professor E. J. Wickson, of the University of California, gives, in the "Pacific Rural Press," the following outline of the uses to which the horticultural section of the recently acquired Experimental Farm near Fresno is intended to be put. This splendid gift is due to the munificent spirit of the late Mr. M. Theodore Kearney, and consists of some 5,400 acres. According to the desire of the donor this land will be used for agricultural education, research, and experimentation.

"*First* : The University Farm will have standard orchards and vineyards, with all desirable kinds of fruit and varieties thereof, which shall be grown true to name, and shall serve as a source of material for wide pomological studies as well as court of last resort for all questions of identification and nomenclature. It will also be a source of cuttings and scions necessary to test these questions locally in various parts of the State, whenever issues arise.

"*Second* : Aside from these standard collections, there will be commercial orchards and vineyards with enough of each variety to demonstrate the best methods of handling in actual practice the trees and vines, and the fruits which they bear. There will be, at proper times of the year, announcements that any one interested can go to the farm to learn pruning, spraying, fumigation, irrigation and all other practical arts of culture, and other times when fruit picking, packing, drying, etc., will be demonstrated.

"*Third* : There will be a full outfit of buildings for the different methods of fruit preservation with artificial agencies, and for the manufacture of fruit products, such as fruit drier and cannery, winery and cellar, distilling and other equipment. All these operations will be actually performed and taught.

"*Fourth* : Plantations of small fruits will also be maintained for observations of varieties and for instruction in culture and handling of products.

"*Fifth* : The growth of vegetables will be undertaken on a commercial scale, both under rainfall and irrigation, and variety tests will also be constantly in progress. Forcing operations will be provided for.

"*Sixth* : Methods of propagation of trees and plants will naturally be constantly pursued for instructional purposes and as introductory to nursery practice with all classes of growths—ornamentals, fruit trees and vines and forestry plantings.

"*Seventh* : Plant protection, to be secured by an understanding of the various injurious insects and plant diseases, and the best ways to cope with them or to avoid them, will be amply demonstrated and inculcated.

"*Eighth* : In all buildings and appliances for horticultural work, as for other equipment of the farm, it is intended to regulate design and expenditure as far as possible, so that the pupil shall work in buildings and use tools and machines such as he can construct and purchase for his own use afterwards, and not in show buildings and with gilded tools. Thus he can return from the instruction with sketches and lists of these to use in making up his own home outfit. Although, of course, large buildings will be required for assembly and class-room purposes, the working parts of the farm will be, so far as possible, instructive, because susceptible of reproduction for actual use.

"*Ninth* : There will be going on on the farm constantly, so far as funds permit, research and experiment work in pomology, plant breeding, plant protection from pests and diseases, all of which will constitute horticultural uses of the farm, and be effective not only in advanced instruction, but in the promotion of horticultural science."

As is generally known California stands pre-eminent amongst the American States as a fruit-producing country, and it is plainly evident that no effort will be spared to enable her to maintain that position. The necessity of the study of horticulture in all its branches is fully recognised as the principal means to that end ; and arrangements are made to enable the youth of the country to avail themselves to the full of the opportunities offered at the various Experimental Stations throughout the land. It is the custom of the University of California, under whose control these stations are placed, not only to afford every facility to resident students, but to give short courses of lectures, with opportunities for gaining practical experience to all comers at different periods of the year. Short terms of from ten to fourteen days' duration are given annually, and that they are widely appreciated is shown by the number of students attending them. It appears to the writer that, although perhaps impossible at the present moment, some facilities of a similar nature would be of the utmost service to the Transvaal. It is too much to expect, in a comparatively new country, that buildings, etc., on a scale equally extensive to the extremely well-equipped structures referred to by Professor Wickson could be erected immediately ; but it is hoped that soon quarters will be provided on the Potchefstroom Experimental Farm which will afford accommodation for a good number of students who may be anxious to acquire a knowledge of farming in its various branches. When this time arrives it is proposed that any who are specially desirous of studying fruit growing may take a course of 12 months or more on the Horticultural Division, learning the practical part of the work from observation,

whilst periodical lectures will be given dealing with the scientific side, and explaining the reasons as to why the several operations should take place, etc.

The fruit trees and vines standing there at present fulfil the requirements of the first use of an Experimental Orchard. As new varieties arise these will be added for trial purposes, whilst as experience shows that certain other kinds are not desirable or suitable for the Western Transvaal, these will be discarded ; and a report published as to the general behaviour of such sorts, showing why such an unfavourable decision has been arrived at. The question of nomenclature is an important one, especially for the nurserymen of this Colony. Customers frequently order trees under a certain name, and are surprised to find, after a few years, that the trees bear fruit quite unlike that which was anticipated. This is perhaps owing to the wrong name having been quoted when ordering, or possibly from the nurseryman having propagated a variety under the impression that it bore a certain name, when in reality it was a similar but quite different fruit. Many fruits also are known by half-a-dozen or more synonyms, and it is necessary that some standard should be fixed which shall be final, and apply to South Africa generally and the Transvaal in particular. Such standards may be found in the Experimental Orchards of the various Government Experimental Farms, and in those of the Horticultural Division.

* * * *

These orchards supply, at a nominal cost, cuttings and scions of most of the fruit trees grown, and are thus a benefit to the community at large. Nurserymen within the Transvaal also avail themselves of the opportunity of securing new and reliable varieties, and one result of this later on will be that no complaints will be heard of "imported" fruit trees not bearing fruit. No nurseryman would willingly propagate trees which are not likely to prove profitable to the buyer, and, with the experience gained at the Experimental Orchards at his service, no possible excuse can exist for supplying other than varieties which are of known good fruiting qualities. If all the imported varieties of fruit trees planted in this Colony during the last few years had borne fruit, the value of that product would amount possibly to £3,000 to £5,000 per annum. Unfortunately many of these trees do not bear, and the purchaser suffers the loss.

At the Experimental Orchards of this Division a sufficient number of trees of each kind are planted to show the best methods of handling each variety from a cultural point of view. Different distances have been observed in planting, and different methods of marking out an orchard adopted. These are explained to enquirers, and reasons given as to why such different treatments are accorded to the various fruits. During such time as specially interesting work is going on such as pruning, spraying, etc., students and anyone interested may come and learn the systems and methods adopted, and, in addition, criticism is invited.

The marketing of fruit will also be shown in as far as picking and packing are concerned. Few people know how to pick fruit properly for the market; the proper stages of ripeness for the home and export business; and still fewer know how to pack fruit, and especially soft fruits, so that they may reach their destination in a fresh, tempting-looking condition.

Fruit drying, both in the sun and by means of evaporation, is shown to students and all who may be sufficiently interested to come and watch the process. The packing of the dried product, in a tasteful and effective manner, will also be demonstrated. The cultivation of small fruits, such as berries of all kinds, suitable to the climate is also shown, the bearing and other qualities of the different varieties noted for the information of growers. The various methods of propagation of all kinds of fruit trees and vines are to be learnt here. Classes of students are taken and initiated into the different methods adopted in budding and grafting. Such special work as hybridization will be also open to investigators in this field of experiment, and the reasons given why such work is undertaken and the various methods adopted in expectation of attaining certain results.

In fine every use to which an experimental orchard can be put is open to the investigations of all and sundry. The work carried on is not undertaken for the benefit of the Department, but of the public at large, and especially those who have a natural bent in this direction. That such experimental work is absolutely indispensable to the future well being of the fruit growing industry of the Colony goes without saying. Next to nothing has been done in the past. The present is the time to train the youth of the Transvaal in methods which will place him on an equality with competitors in other Colonies, for without such training successful competition is impossible.—R.A.D.

NOTES ABOUT THE PURCHASING OF FRUIT TREES.

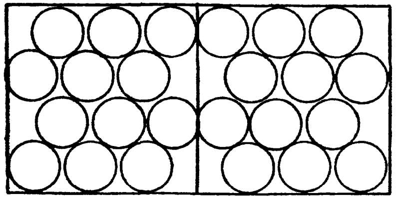
Most people who buy fruit trees for winter planting begin to think about making their purchases late in July, sometimes in August, and occasionally in September. This is perhaps the most unwise way anyone could possibly go to work, for the following reasons:—

1. In the first place it denotes lack of forethought, for the preparation of the ground, digging of holes, etc., should have been completed in June or July.

Late purchasing means hurried planting and insufficient preparation of the land, often resulting in loss of trees.

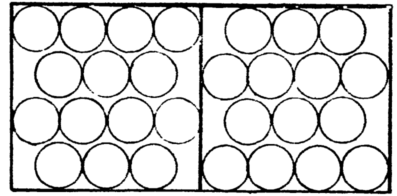
2. Late purchasing means that the buyer, nine times out of ten, cannot get the varieties he wishes to have. The early bird has caught the worm. In other words, those who placed orders in April or May have taken the pick of the nurserymen's stocks, securing not only the best kinds of fruit, but also the best grown and healthiest trees, leaving the belated ones to take what they can get.

No. and Size 96. Dia. 3 1-2 in.; Layers 4.



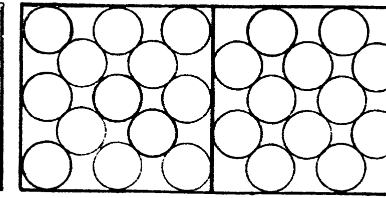
Layers 1 and 3—12; Layers 2 and 4—12.

No. and Size 112; Dia. 3 1-4 in.; Layers 4.



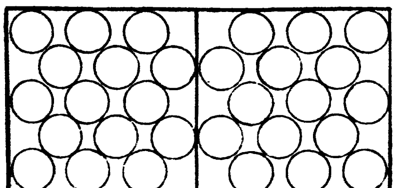
Layers 1 and 3—14; Layers 2 and 4—14.

No. and Size 126; Dia. 3 1-8 in; Layers 5.



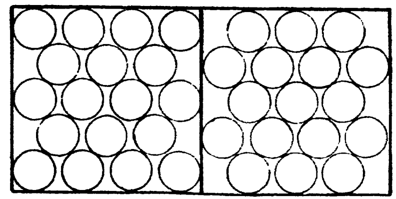
Layers 1, 3 and 5—13; Layers 2 and 4—12.

No. and Size 150; Dia. 3 1-16 in.; Layers 5



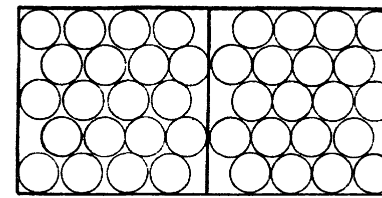
Layers 1, 3 and 5—15; Layers 2 and 4—15.

No. and Size 176; Dia. 2 15-16 in., Layers 5.



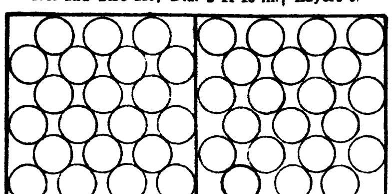
Layers 1, 3 and 5—18; Layers 2 and 4—17.

No. and Size 200; Dia. 2 13-16 in., Layers 5.



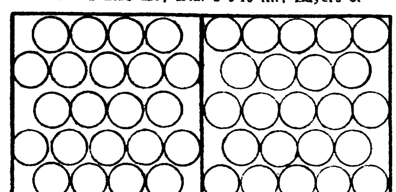
Layers 1, 3 and 5—20; Layers 2 and 4—20.

No. and Size 216; Dia. 2 11-16 in.; Layers 6.



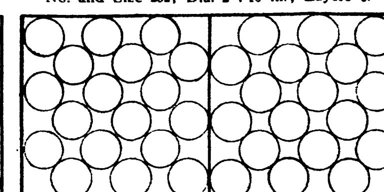
Layers 1, 3 and 5—18; Layers 2, 4 and 6—18

No. and Size 226; Dia. 2 9-16 in.; Layers 5.



Layers 1, 3 and 5—23; Layers 2 and 4—22

No. and Size 252; Dia. 2 7-16 in., Layers 6.



Layers 1, 3 and 5—21; Layers 2, 4 and 6—21

Plate 8. **Showing Method of Packing Citrus Fruits.**

As all the leading recognized profitable kinds are sold out possibly in May, those which are left over are likely to be of little value, being perhaps varieties which have not been taken up, because the careful buyer has made sure of getting the best only. Oftentimes these unsuitable sorts are purchased and planted, with the result that later on, when fruit is expected, the trees are found practically valueless ; then nothing remains but to graft them over or dig them out and replant, either of which practices, though sound enough, are not conducive to peace of mind. A fruit tree which does not bear is about as useless an article as one can find.

Late purchasers often take advantage of auction sales of fruit trees, and get hold of a lot of stuff which has been left over in some of the Natal and Cape Colony nurseries. In fact, the Transvaal takes the leavings of these Colonies, and a good deal of the stuff sent up for sale by auction is rubbish of the worst kind. The writer recently saw a consignment sold in Pretoria at from fair to high prices, and there was not a single fruit tree amongst them which he would have owned at a gift. Enough has been said to show that late buying is undesirable.

It remains to point out that the best way to secure good healthy trees of good bearing kinds is to place your orders early in the season. Not later than May, if possible. The pick of the market is then to be secured.

Go to a reputable firm of nurserymen ; there are plenty of them in Cape Colony or Natal, as well as some few in our own Colony. State your requirements, and if you do not know the names of the kinds you want, take their advice on early, medium or late varieties, and inform them that you hold them responsible for the quality of the trees, such as being well grown, one year old, and true to name. These firms have a reputation at stake, and will sell you good trees. Or you can at any time make enquiries of the Government Horticulturist ; his advice being at all times freely given, and it is based largely, so far as the Transvaal is concerned, on the results already obtained at the various Experimental Orchards, of which there are four in different parts of the country.—R.A.D.

THE EXPORT OF ORANGES FROM THE TRANSVAAL TO ENGLAND.

Largely owing to the efforts of Mr. F. T. Nicholson, Secretary of the Transvaal Agricultural Union, supported by the Government, who generously provided the sum of £300 for the purpose, this Division has been able to undertake the first practical test of shipping oranges which has ever been attempted in the Transvaal. The first shipment left during the month of June, and consignments were forwarded at weekly intervals until the end of July.

It was decided to purchase fruit outright from growers, and have it sent to a central packing house in Pretoria. This entailed handling

twice, and in some cases a double journey by rail, which resulted in additional expense and some damage to the fruit during transit. These causes combined with some loss from pilfering whilst the packing process was going on, led to the adoption of a different system. The packer was sent out to the farms, and the actual work of packing was done in the different groves with much more satisfactory results. Growers were able to see and to assist in the work, and obtained an insight into the correct manner of packing the fruit which will enable them to undertake similar work for themselves next year should they so desire.—R.A.D.

* * * *

The method of packing adopted was identical with that in vogue in California and Florida, the same sized boxes were used, and each separate fruit wrapped in paper marked with a special brand. Unfortunately no grading machine was obtainable. This meant that the whole of this important work had to be done by hand. The accompanying plates show the style and method of packing used ; the exact number of fruits placed in each box, together with a glimpse of the pile of boxes packed and ready for shipment. The actual work of packing was done by a Florida orange grower, whose services this Department had secured, and the reports which have been received from the London agents speak in the highest terms as to the condition of the fruit on its arrival. The "pack" averaged 150 per box, some few cases of 96 were sent, and a few only of 200.

In all cases the greatest care was taken to pack only sound, clean, bright fruit, free from blemish of any kind. It may be said that on the whole all the consignments consisted of nothing second rate, and in most instances the fruit was really first class. A few boxes of Lisbon lemons, of superior quality, proved disappointing, as they only averaged 6s. per case of 125. No naartjes were purchased by the Department, but a few boxes, packed in single layers, each case holding two dozen fruits, were forwarded at the owners' risk. The price obtained for these was 2s. per box.

It will be seen from the above statement that from the point of view of carrying qualities no difficulty exists in the export of Citrus fruits from our orchards. The difficulty comes in when one goes into the question of railway rates and boxes. Approximately each case of fruit cost in freight from Pretoria to Durban 1s. 9d., and this after the allowance of the 20% reduction granted to the Agricultural Department. From Durban to London cost 1s. 3d. per case, resulting in a total of 3s. per case. Figures such as these show at once that under such conditions it is impossible to expect an export citrus fruit business.

Redress may be obtained in the following direction. An *Export Freight Rate* must be obtained from the Transvaal to Durban, which shall bring the cost down to 6d. per box. This should not be difficult under the fostering care shown for agriculture by our present Government, especially when it is remembered that hundreds of trucks go down to the coast empty.

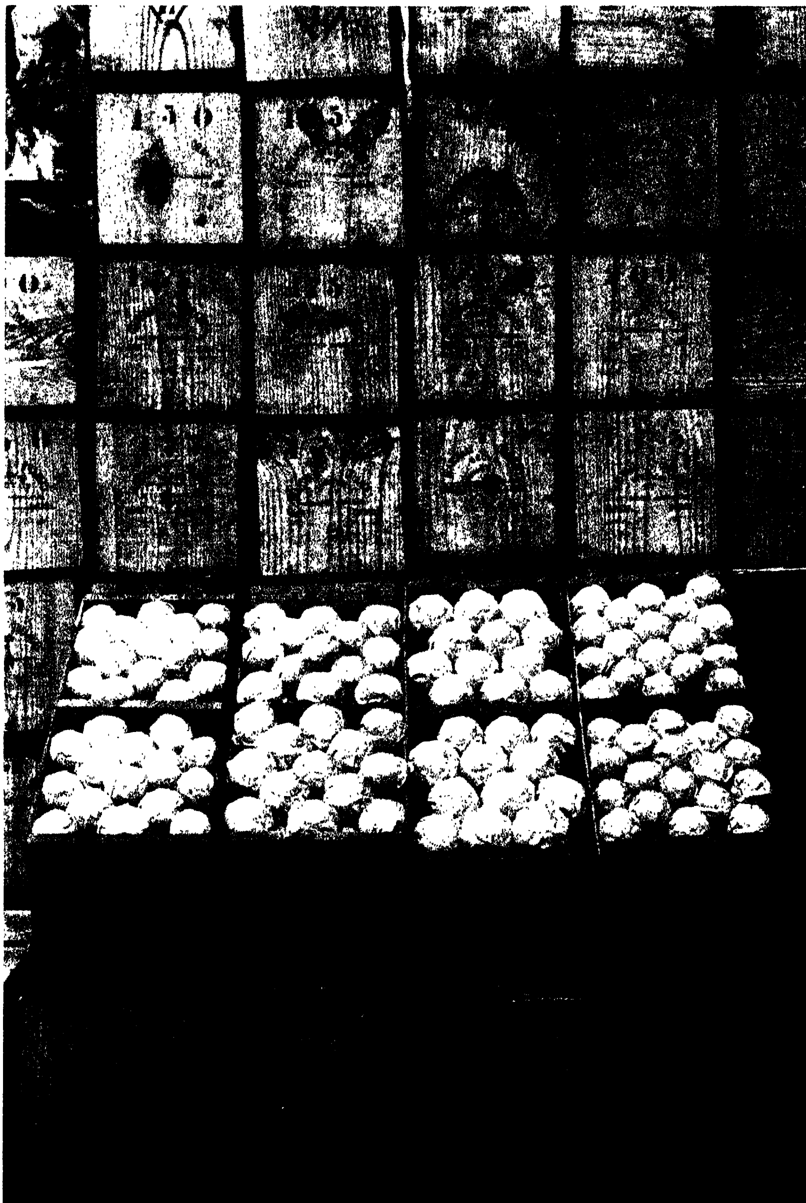


Plate 9.

Showing Method of Packing Oranges for the English Market.

Transvaal Department of Agriculture.

The cost of boxes must be reduced to 10d. or 1s. each, and here again we must look to the Government for assistance. Boxes such as those used were purchased from a local manufacturer in Durban at 9d. each. When they arrived in Pretoria the railway rates brought each box up to 1s. 6d., showing just 100% increase on the purchase price. The present duty of 15% on imported boxes, imposed at the last meeting of the Customs Convention, must be abolished. Such reductions would make the actual cost of shipment work out at the following figures :—

	s.	d.
Freight, Transvaal to Durban	0	6
,, Durban to London	1	3
Cost of box	1	0
Paper and nails	0	4
	3	1

This would leave 3s. 11d. for 150 oranges, minus a small sales commission, and based on an average price of 7s. per box.

It must be understood further that the present summer in England has been one of the coldest and wettest known for some years, and the weather has not been conducive to a large demand for fruit. Reports from the agents to whom these oranges were consigned for sale state that as our fruit becomes better known it becomes better liked, and as it comes to occupy its proper place in the market and becomes a recognised article of commerce, so we may look for regular returns at moderately remunerative prices. The prices obtained for the earlier shipments averaged 7s. per case, later as the fruit became better known, prices improved, and markedly so when that which had been packed on the farms began to appear on the market, as much as 11s. 6d. being paid in some instances, with a possible average of 8s.

* * * *

What is a paying price? This question has met with many answers in this Colony. For instance one farmer states that a paying price is 6s. per 100. Another says : "I always get 8s. per 100 for my oranges or else I don't sell them ; whilst a third leaves his fruit on the trees until October and November in hopes of getting a price that will pay, say 15s. per 100. In Florida and California, U.S.A., with land costing £40 per acre (not morgen), labour at 6s. per day, with irrigation water oftentimes to be paid for, and the original cost of good trees at least at 4s. each, together with the usual freight charges, growers have perforce to be content with from 5s. to 12s. per box in New York, and on these figures an orange grove will pay up to and over £50 per acre.

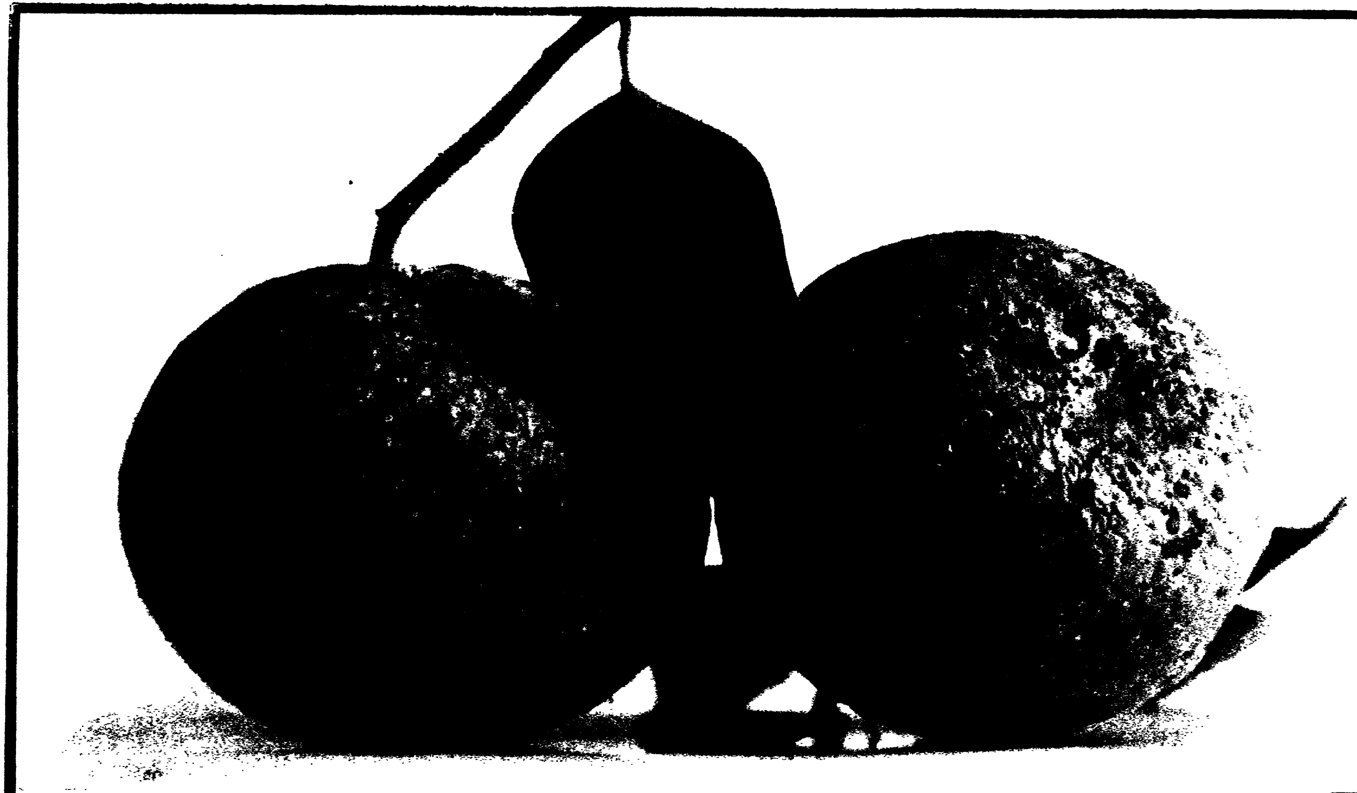
In Cape Colony, before the advent of the "Australian Bug," some twenty years ago, oranges were sold freely at from 2s. to 3s. per 100 ; the quantity of this fruit was entirely in excess of the demand, and consequently the market was overstocked. Yet many Cape growers have told the writer that at these figures their trees paid handsomely.

Conditions are not so entirely dissimilar between the Transvaal and those countries just named, that some definite idea cannot be obtained as to what is a paying price here. If anything the Transvaal can produce its fruit more cheaply, especially in the case of the older orchards in the Colony; and it may be stated definitely that 3s. per 100 is quite a satisfactory figure to obtain. In any case it cannot be too clearly pointed out that fancy prices are a thing of the past as far as the bulk of the crop is concerned. To-day the Transvaal is in touch with the world's markets, and must inevitably find and accept its proper level.

Future export work must of necessity be taken up by the Co-operative Societies existing in the various orange growing districts. It is a work which such Societies are eminently suited to undertake. A central packing house, with perhaps some smaller ones, will be needed for each district, proper railway facilities are imperative, an expert packer must be engaged, and box making machinery and grading machines provided. If this is done, and the best fruit only packed, an export orange business will be an assured success, provided the necessary freight rates are granted. As this matter lies altogether in the hands of the people of our Colony we may rest assured that they will effectually remove the obstacles which at present retard the Transvaal from taking its rightful place as an orange exporting country.

ORANGES IN COLD STORAGE.

It may be of interest to note that the Transvaal Cold Storage has set aside a room for cold storage of fruit at their Pretoria branch. A request was made by one of our leading fruit growers at the Warmbaths that this Division should try and make some such arrangement. It is a pleasure to state that the Storage people met the proposal in the most satisfactory manner, and now some thousands of oranges are being kept at a temperature of 40°, with possibly an occasional variation of 1 point above or below. The fruit is examined every ten days. The first thirty boxes were put in on July 9th, and up to the date of writing (September 1st) only five specimens have shown signs of decay. On examination, these five showed cuts in three cases and thorn punctures in two others, pointing out again the necessity for absolutely the greatest possible care in both picking and handling. The fruit is placed in standard boxes (the box holding 2 cubic feet), and the rental per month is 1s. per box, or about 8d. per 100. The writer does not look upon this business as an experiment, but the growers and storage owners evidently do. The result will probably be that next season the whole of the space will be engaged, instead of only a small portion as at present, with the advantage that at a slight outlay for storage the sale price of the fruit has been increased 100% in three months.—R.A.D.



The Florida Red Scale.

Chrysomphalus aonidum, LINN.

A common pest of citrus trees found in the South-Eastern part of the Transvaal.

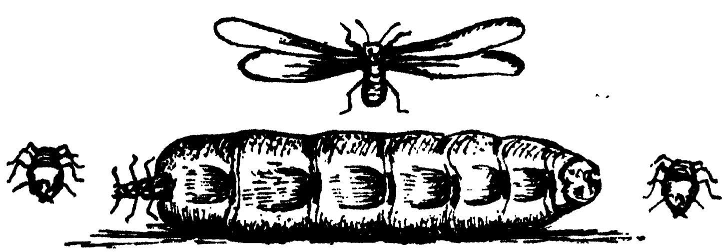
THE ENTOMOLOGICAL SECTION.

No. I.]

NOTES ON TERMITES.

By C. W. Howard, B.A., Entomologist.

No. II.



In the "Agricultural Journal," for July, 1906, there appeared an article on the Termites or White Ants of the Transvaal, in which considerable space was given to a discussion of proposed experiments for rendering wood, for building purposes, immune to the attacks of these insects. Since that time over a year has elapsed, and, as the subject is a very important one to builders in the Transvaal, it seems that sufficient time has passed to render a preliminary report on the subject of some value.

The tests were carried on in the following manner. About 800 pieces of wood were obtained of a uniform size, 3 in. x 3 in. x 12 in. These were mostly of deal, but some blue gum, boekenhout, and lemon wood (*Xymalos monospora*) were employed; all of which woods are readily eaten by white ants. In selecting the materials with which to treat the woods, we tried to test such substances as the farmer would have at hand or could easily obtain, also giving attention to patent mixtures, for sale on the South African market, which are recommended for this purpose.

The methods for treating the wood were four in number: *i.e.*, (1) soaking in the mixture for twenty-four hours; (2) soaking for twenty-four hours and then bringing to the boiling point over a fire and boiling for from one to two hours; (3) painting the surface with one or two coats of the mixtures; (4) boring a hole ½ in. in diameter down the middle, filling this with the liquid or dry chemicals and plugging up the opening, leaving the chemical to soak through the wood. A certain number of pieces of deal and blue gum were left untreated, to act as a check on the experiment.

When the pieces of wood were all ready, they were thoroughly mixed up, so that any two pieces which had been similarly treated

should not be together, and were then planted in the soil about 12 feet apart each way, with the upper ends above the surface. Care was taken to choose a place to bury the wood where termites were very abundant. For this purpose Mr. E. F. Bourke, of Pretoria, kindly allowed us to make use of his farm Kalkheuvel, near Pienaar's River Station, District of Pretoria. Parts of this farm are badly infested with white ants, and the worst parts were employed for this experiment. The wood was buried on the 27th March and 15th April, 1906. The first examination was made on June 4th, 1907.

* * * *

The following table will indicate materials employed, kind of wood used and the results obtained. The materials have been grouped together under several headings for convenience :—

I.—Arsenicals.

Wood employed.	Chemical used.	Treatment.	Result.
Deal ...	Arsenite of Soda, 10%	2 pieces soaked 24 hours	Not eaten.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	do.	2 pieces, hole in centre filled ...	Slightly eaten.
Lemon Wood	do.	1 piece soaked 24 hours	Not eaten.
Blue Gum...	do.	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
Deal ...	Atlas Preservative A. full strength ...	2 pieces painted once	do.
do. ...	do.	2 pieces painted twice	do.
do. ...	do.	1 piece, hole in centre	do.
Lemon Wood	do.	1 piece soaked 24 hours	do.
do. ...	do.	1 piece painted once	do.
Blue Gum...	do.	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	do.	2 pieces painted once	do.
Boekenhout	do.	2 pieces painted once	do.
Deal ...	Atlas Preservative A. 10% solution ...	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	Demuth's Dip. 10% solution	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	Cooper's Dip. 1 pt. to 9 gals. water ...	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	Alderson's Cattle Dip. 4 lbs. to 8 gals. water	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	Street's White Ant Cure, 10% solution	2 pieces soaked 24 hours	Pieces were lost.
do. ...	do.	2 pieces soaked 24 hours and boiled...	Not eaten.
Blue Gum	do.	2 pieces soaked and boiled	do.
do. ...	do.	2 pieces painted once	Slightly eaten.

In the above experiments it is plain that arsenical compounds are very effective. In addition to the above several trials were made by

mixing white arsenic or arsenite of soda with such substances as a solution of soap or lime milk. Nothing is to be gained by these mixtures ; they do not make the solution any more effective, nor do they make its application any easier. The basis of Atlas Preservative, the various dips, and Street's White Ant Cure, is arsenic, and the above table shows their effectiveness. The reason for the one case where Street's White Ant Cure was not wholly effective can be easily accounted for by the difficulty in painting a piece of wood and applying enough of the solution to soak very far below the surface.

II.—Tar, Creosote, and Carbolic Acid Compounds.

Wood employed.	Chemical used.	Treatment.	Result.
Deal ...	Coal Tar	2 pieces painted once	Not eaten.
do. ...	do.	2 pieces painted twice	do.
Blue Gum...	do.	2 pieces painted once...	Slightly eaten.
Deal ...	Stockholm Tar ...	2 pieces painted once...	Not eaten.
do. ...	do. ...	2 pieces painted twice	do.
Boekenhout	do. ...	2 pieces painted once...	Slightly eaten.
Blue Gum...	do. ...	2 pieces painted once...	do.
Deal ...	Creosote, 10% ...	2 pieces soaked 24 hours	do.
do. ...	do. ...	2 pieces soaked 24 hours and boiled...	do.
do. ...	Creosote, full strength	2 pieces painted once...	do.
do.	do.	2 pieces painted twice	Not eaten.
Lemon Wood	do.	1 piece painted once	do.
Deal ...	Solignum, full strength	2 pieces painted once...	do.
do. ...	do.	2 pieces painted twice	do.
do. ...	do.	1 piece, hole in centre filled	Slightly eaten.
Blue Gum...	do.	2 pieces painted once...	do.
Boekenhout	do.	2 pieces painted once...	Not eaten.
Lemon Wood	do.	1 piece painted once	do.
Deal ...	Asphenite, full str.	2 pieces painted once...	do.
do. ...	do.	2 pieces painted twice	do.
Lemon Wood	do.	1 piece painted once	Slightly eaten.
Deal ...	Crude Carbolic Acid	2 pieces painted once... ...	Not eaten.
do. ...	do.	2 pieces painted twice	do.
do. ...	do.	2 pieces soaked 24 hours	Half eaten.
do. ...	do.	2 pieces soaked 24 hours and boiled .	Slightly eaten.
do. ...	do.	1 piece, hole in centre filled	do.
Lemon Wood	do.	1 piece painted once ...	do.
do. ...	10% sol. Carbolic Acid	1 piece soaked 24 hours	do.
Deal ...	Jeyes Fluid, full str.	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	Jeyes Fluid, 10% sol.	3 pieces soaked under pressure of 50 lbs. to square inch	do.
do. ...	Jeyes Fluid, full str.	2 pieces painted once...	Not eaten.
do. ...	do.	2 pieces painted twice	do.
do. ...	do.	1 piece, hole in centre filled	Slightly eaten.
Lemon Wood	Jeyes Fluid, 10% sol.	1 piece soaked 24 hours	do.
Blue Gum...	Jeyes Fluid, full str.	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
Deal ...	Carbolineum, full str.	2 pieces painted once	Not eaten.
do. ...	do.	2 pieces painted twice	do.
Lemon Wood	do.	1 piece painted once	do.
Blue Gum...	do.	2 pieces painted once...	Slightly eaten.

While arsenical mixtures act as a protection to wood because they are poisonous, and destroy the ants which might eat it, the above substances protect the wood by rendering it distasteful, or by giving it an offensive odour. Both the tar and creosote, as well as the solignum and asphenite can be recommended. The cases where the wood was slightly injured can easily be traced to faults in treatment. Once painting with such materials does not seem to be sufficient. They are usually very thick, and do not penetrate the wood quickly or deeply, and a stronger solution of creosote than 10% seems necessary. Therefore, to render these materials effective, great care must be exercised to apply them thoroughly. Crude carbolic acid and Jeyes' Fluid seem fairly good, but not so effective as the other substances.

III.—Tobacco Extracts.

Wood employed.	Chemical used.	Treatment.	Result.
Deal ...	Transvaal Tobacco Extract. 10% sol.	2 pieces soaked 24 hours	Slightly eaten.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
Lemon Wood	do.	2 pieces soaked 24 hours and boiled...	Slightly to half eaten.
Blue Gum...	do.	2 pieces soaked 24 hours and boiled...	Slightly eaten.
Deal ...	French Tobacco Extract ...	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	do.	1 piece painted once	do.
do. ...	Austrian Tobacco Extract ...	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	do.	1 piece painted once	do.
Lemon Wood	Austrian Tobacco Extract. 10% sol.	1 piece soaked 24 hours	Half eaten.
Deal ...	Switzerland Tobacco Extract ...	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	Laidlaw's Tobacco Extract ...	2 pieces soaked 24 hours	Slightly eaten.
do. ...	do.	2 pieces soaked and boiled	do.

Tobacco extracts of all sorts seem worthless for this purpose. None of them contain more than an average of 8% of nicotine, and this is easily washed out by water in the soil, leaving the wood entirely unprotected.

IV.—OILS AND PAINTS.

Wood employed.	Chemical used.	Treatment.	Result.
Deal ...	Raw linseed oil	2 pieces painted once... ...	Slightly eaten.
do. ...	do.	2 pieces painted twice ...	do.
do. ...	do.	1 piece, hole in centre filled ...	do.
Boekenhout	do.	4 pieces painted once... ...	Half eaten.
Deal ...	Raw linseed oil and red lead	2 pieces painted once... ...	Not eaten.
do. ...	do.	2 pieces painted twice ...	do.
do. ...	Raw linseed oil and white lead	2 pieces painted twice ...	do.
do. ...	Raw linseed oil and lamp black	2 pieces painted once... ...	do.
Lemon Wood	Raw linseed oil and resin...	1 piece painted once	Half eaten.
Deal ...	Raw linseed oil and red lead and arsenite of soda ...	2 pieces painted once... ...	Not eaten.
do. ...	Raw linseed oil, white lead and arsenic (white) ...	2 pieces painted once... ...	do.
do. ..	do.	2 pieces painted twice ...	do.
Lemon Wood	Raw linseed oil, red lead and arsenite of soda ...	1 piece painted once	do.
do. ...	Red lead (paste)	1 piece painted once	do.
do. ...	Red oxide of iron and raw linseed oil	1 piece painted once	Slightly eaten.
Deal ...	do.	2 pieces painted once... ...	Not eaten.
do. ...	do.	2 pieces painted twice ...	do.
Lemon Wood	White lead (paste) and white arsenic	1 piece painted once	do.
Deal ...	Paraffin	1 piece, hole in centre filled ...	Slightly eaten.
do. ...	Crude castor oil	2 pieces painted once... ...	do.
Blue Gum...	do.	2 pieces painted once... ...	Half eaten.
Deal ...	Castor oil emulsion ...	2 pieces soaked 24 hours ...	Slightly eaten.
Blue Gum...	do.	2 pieces soaked 24 hours and boiled	Half eaten.
Boekenhout	do.	2 pieces soaked 24 hours ...	do.
Deal ...	Castor oil emulsion and creosote, equal parts ...	2 pieces painted once... ...	Slightly eaten.

Oils, as well, cannot be relied upon unless made into a paint by mixing some substance with them which is in itself poisonous. As the table shows, linseed oil when used as a paint with red lead, white lead, with or without the addition of arsenic, proves entirely satisfactory. Both red lead and white lead are in themselves poisonous, which accounts for their effectiveness.

V.—SOAPS.

Wood employed.	Chemical used.	Treatment.	Result.
Deal ...	Blue mottled soap, 10% solution ...	2 pieces soaked 24 hours	Slightly eaten.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	Blue mottled soap, 5% solution ...	2 pieces soaked 24 hours	Not eaten.
do. ...	Blue mottled soap, plus 5% solution arsenite of soda	2 pieces soaked 24 hours and boiled...	do.
do. ...	Resin wash and water, equal parts ...	2 pieces soaked 24 hours	Slightly eaten.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	Paraffin emulsion, 10% solution ...	2 pieces soaked 24 hours	do.
do. ...	do.	2 pieces soaked 24 hours and boiled...	do.
do. ...	Paraffin emulsion, 5% solution ...	2 pieces soaked 24 hours	do.
do. ...	Paraffin emulsion, plus 5% solution arsenite of soda	2 pieces soaked 24 hours and boiled...	do.

Nothing can be said in favour of soaps for this purpose. They are easily washed out by water, and in themselves would not render the wood either distasteful or poisonous.

VI.—COPPER SULPHATE (BLUE-STONE).

Wood employed.	Chemical used.	Treatment.	Result.
Deal ...	Saturated solution copper sulphate ...	2 pieces soaked 24 hours	Not eaten.
do. ...	do.	2 pieces soaked and boiled	do.
do. ...	5% solution copper sulphate	4 pieces soaked 24 hours, then boiled and later soaked 24 hours in a solution of freshly-slaked stone lime	Slightly eaten.
do. ...	Copper sulphate crystals	1 piece, hole in centre plugged and filled up	do.
do. ...	do.	1 piece, hole slanting from side, filled and plugged up	Half eaten.
Blue Gum...	Copper sulphate 10% solution	2 pieces soaked 24 hours in hot solution	Slightly eaten.
do. ...	do.	2 pieces soaked 24 hours in cold solution	do.
Boekenhout	do.	2 pieces soaked 24 hours in cold solution	do.

The table would lead one to think that very little could be expected of this chemical, but a careful consideration of the subject will show otherwise. It will be noticed that where a saturated solution was employed (*i.e.*, a solution holding all the copper sulphate which it can dissolve) the wood remained intact. Where a weak solution was employed, or where it was placed in a hole in the centre of the wood,

and consequently could not penetrate to the exterior, the wood was eaten. In the third test, where pieces of wood were soaked in weak copper sulphate solution and then soaked in lime milk, a new chemical, copper hydroxide, would be produced, which is easily washed out of the wood by water in the soil, leaving it quite unprotected.

VII.—The following substances, which had been recommended by various authorities, were also tested, but, owing to their non-poisonous character, or to their great solubility, which would render them easily washed out of the wood, they all proved failures. In the few cases where they apparently succeeded, it was found to be due to the fact that arsenic had been mixed with them. The following chemicals were tested :—

Mercuric chloride.	Hyposulphite of soda.
Calcium chloride.	Carbonate of soda.
Sulphuric acid.	Alum.
Sulphate of iron.	Salt.
Sulphate of soda.	

Acetate of lead and borax gave some evidence of proving useful, but must be used in very strong solutions. Both were used in 10% solutions, which were far too weak. Melted sulphur, melted resin and glue were also tested by employing them as paints on the surface of the wood. The first two protected the wood, except where they chipped off, but are obviously of no practical use. Glue would prove very effective if the wood was thoroughly coated with it, and then washed with a solution of formaline to render the glue hard, and form a firm varnish on the surface.

It is often recommended that wood be charred to protect it from white ants. Two pieces of deal were thus treated, but unfortunately they cracked after being buried, and the ants entered through the cracks and ate the wood.

The milk of the large tree Euphorbia or "Naboom" (*Euphorbia rheinhardtii?*) which grows in the Bush and Low Veld, was also tried, as being an easily obtained South African product. Three pieces of deal and one piece of blue gum were painted with this, but only two pieces escaped injury. Euphorbia milk is extremely caustic in its effect, and this ineffectiveness can probably be attributed to lack of thoroughness in the treatment of the wood.

The control on the above experiments consisted of twelve pieces of blue gum and 30 pieces of deal, which were not treated in any fashion, and were so distributed among the other pieces of wood that every sixth to tenth piece was untreated. Each of these pieces was more or less eaten by the ants.

Summary.

These tests indicate that any solution containing arsenic, also many of the tar, creosote and carbolic acid compounds are excellent substances to protect wood against white ants. The best methods of applying the mixtures are by soaking the wood in them to insure

thorough penetration. This, however, involves the erection of large tanks, and could be done easily and cheaply only by large lumber and building firms. Painting the surface must be resorted to by most people, but is not as effective as soaking, unless repeated several times and very thoroughly done, otherwise not enough of the solution is placed upon the wood to penetrate to any depth. The best method of treating timber would be to thoroughly soak it in a strong solution of arsenite of soda, say 10%, or in Atlas Preservative, and then thoroughly coat the surface with tar, Stockholm tar, creosote or some other tar compound. A varnish of glue, followed by a coat of formaline would be as effective.

* * * *

The question of immunity of native and South African woods is often discussed. To obtain some accurate information on this point, as many native woods as possible were obtained and buried along with the other pieces used in this experiment. They were not treated with any chemicals, and the following list shows the results obtained. Some pieces of imported woods were also included.

WOODS, NATIVE AND IMPORTED, UNTREATED.

3 pieces	Xymalos monospora	Lemon Wood ..	Slightly eaten
3 "	Faurea saligna	Boekenhout	do.
2 "	Acacia nigrescens pallens ...	Knoppiesdoorn ..	do.
4 "	Rhamnus zeyheri ..	Red Ivory .. .	do.
1 piece	Trichocladus grandiflorus ...	Ouder Bosch (Natal) ..	do.
2 pieces	Duguetia quitarensis ...	Lance Wood ...	do.
6 "	Combretum porphyrolepis ...	Lead Wood	Not eaten
2 "	Adina galpini ...	Nhlume, Matroma or Mohambo	do.
2 "	Excoecaria africana	Lambootie	do.
3 "	Olea laurifolia ..	Iron Wood ..	do.
2 "	Rhus viminalis ...	Karriwood	do.
2 "	Ocotea bullata (?) ...	Stinkhout .	do.
2 "	Ptaeroxylon utile ...	Sneezewood	do.
3 "	Pygeum africanum ...	Bitter Almond	Very slightly eaten
3 "	Ochna arborea ...	Cape Plane	Half eaten.
3 "	Podocarpus thunbergii	Yellow Wood	do.
3 "	Podocarpus elongata ...	Bastard Yellow wood ...	do.
3 "	Kiggelaria africana ...	Speckhout	Slightly eaten.
3	Curtesia faginea ...	Assegaihout	Half eaten.
3 "	Gymnosporia deflexa ...	Saffron Wood	Slightly eaten.
3 "	Apodytes dimidiata ...	White Pear	do.
2 "	Scolopia mundii ...	Red Pear ...	do.
3 "	Brachylaena discolor ...	Vaal Bosch	do.
2 "	Casuarina ...	Casuarina	Half eaten.
3 "	Calodendron demidiator ...	Chestnut	Slightly eaten.
2 "	Swietenia mahogani ...	Mahogany (American) ...	Not eaten.
3 "	—	Apple Wood	Half eaten.
2 "	Carya alba and carya sp. ...	American Hickory .	do.
2 "	Liriodendron tulipifera ...	Poplar	do.
2 "	Fagus sylvatica ...	English Beech	do.
2 "	Quercus pedunculata ...	English Oak	Slightly eaten.
2 "	Quercus alba	American Oak	do.
2 "	Fraxinus excelsior ...	English Ash	do.
2 "	Fraxinus americana ...	American Ash	Half eaten.
2 "	Pseudotsuga douglasii ...	Oregon Pine	Not eaten
1 piece	—	Lapashi (S. American) ...	do.
4 pieces	—	Hard Woods	do.

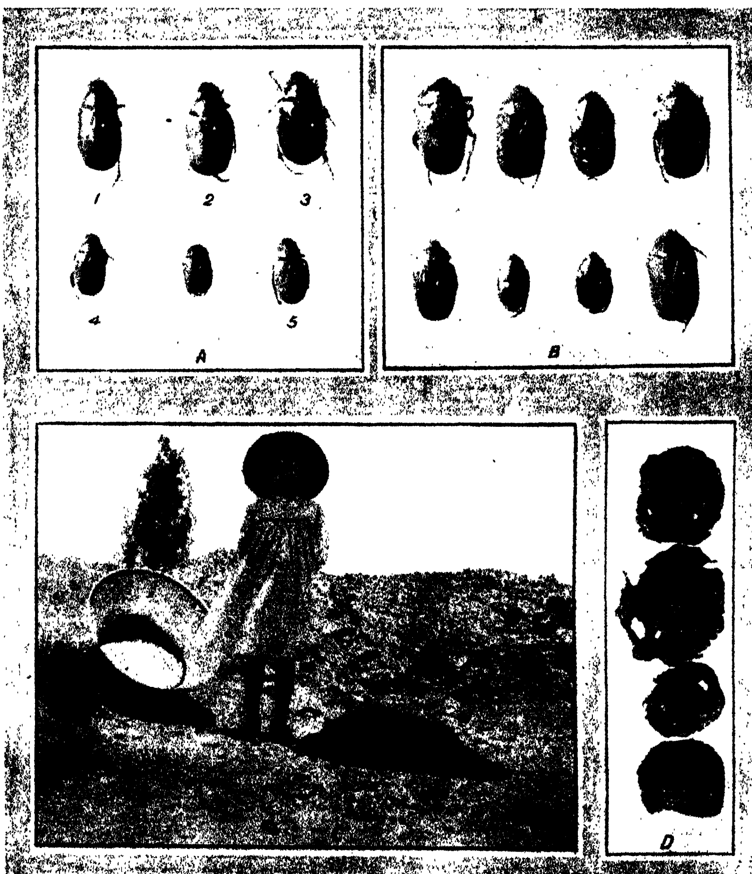


Plate 7.

Cockchafers and Flower Beetles.

A. Cockchafers: *1, Schizonycha elegans; 2, Anomala transvaalensis; 3, Anomala ustulata; 4, Adoretus impurus; 5, Adoretus tessulatus.*

B. Flower Beetles or Cetonids.

C. A pile of Cockchafer Beetles gathered in a small orchard in one night by shaking the trees. They were then killed by throwing them into a bath of paraffin and water.

D. Some ripening apricots eaten by Cockchafers.

This report is only intended to be preliminary. The same pieces of wood have been again buried, and will be allowed to remain another year, when they will be again examined, and a further report made. As we obtain fresh information about substances which might prove effective for treating wood, further tests are being prepared, and will be added to the above.

No. II.]

COCKCHAFERS AND FLOWER BEETLES.

By C. W. Howard, B.A., Entomologist.

During each springtime a great deal of damage is done to Transvaal orchards and vineyards by beetles known as "cockchafers," or "bruin-kever."

Everyone must be familiar with these fat, clumsy beetles with shiny brown bodies which come flying with a loud buzzing noise into the house at dinner-time on a summer night. The lights seem to dazzle the poor creatures, and they go bumping about the room and very probably drop into the dishes, much to the annoyance of the good housewife. The beetles can easily be recognised by the accompanying figure.

There are fifteen or more species of these beetles in the Transvaal, varying in size from nearly half an inch long to three-quarters of an inch, and in colour from dark reddish brown to light yellow or straw colour. There are five species, however, which do more damage to orchard trees than their relatives ; these are :—

(1) *Schizonycha elegans*, a large beetle about three-quarters of an inch long, with shining dark brown wing-covers, covered with very fine punctures.

(2) *Anomala ustulata* is of about the same size, of a straw colour, with darker shadings on the wings, head darker coloured, and three black spots just behind the head.

(3) *Anomala Transvaalensis* is half an inch long, but of a uniform light straw colour, with darker coloured legs.

(4) *Adoretus impurus* is a small beetle about two-fifths of an inch long, of a light straw colour with dark coloured head, and sometimes the edge of the wing covers dark coloured.

(5) *Adoretus tessulatus* is more abundant, of about the same size as the former, but of a dark brown colour, with small white spots in rows down the wing covers. The last two species seem to prefer the foliage of the vine to that of fruit trees (Plate 7).

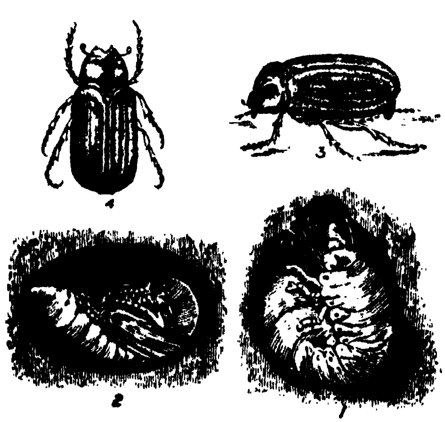
* * * *

During the day they rest concealed under stones or buried in loose soil, but at nightfall they become active and gather upon orchard trees, if such are at hand, and feast until late into the night. When very numerous they frequently strip the entire tree of its leaves, and

if ripening fruit is present will devour that also. The principal trees attacked are peach, apricot, plum, cherry and the vine. The latter is especially liable to attack, and often not a leaf or flower is left.

The beetles live a few weeks, and then the female deposits her eggs in the ground, where they soon hatch. The grubs are of a white or cream colour, smooth, and of a peculiar shape. The body is always bent in a horseshoe or crescent shape, bringing the anal end close up to the head, which is dark coloured and hard, while the rear end is very much swollen, and usually dark blue in colour, owing to the large amount of soil taken into the alimentary canal along with the food. The food of these larvæ, or *white grubs*, as they are usually called, consists of roots of grass, trees, and many other plants which grow upon the veld and in gardens. For this reason they very often become serious pests to garden and cereal crops, but, so far, we have never heard of such an occurrence in the Transvaal, probably owing to the small amount of land which is under cultivation to suitable crops. From one to three or possibly more years is spent in this larval stage. Owing to obvious difficulties it has been impossible to ascertain the exact time occupied in the life cycle, but we know that more than one year is passed by the larvæ of several species. Half grown specimens can easily be found in the winter by digging almost anywhere on the veld.

After reaching full growth, the larva forms a neat elliptical cell in the soil by turning round and round and transforms to the pupa or resting stage, and from this the adult beetle emerges early in the summer.



The remedies against these insects are of two classes; those against the grubs and those against the beetles.

I.—Remedies against the Beetles.

(*a*) As the beetles are so easily attracted to the lights in houses, a method of trapping has been devised. This consists of placing a lighted lamp or lantern over a tin of water, in which a small quantity

of paraffin has been placed. This should all be mounted on a post, or otherwise arranged in the orchard so that the light will attract the beetles. They will fly against it, and drop into the paraffin and water and be killed. This method is well worth trying, but unfortunately does not always work satisfactorily, probably owing to local conditions.

(*b*) The beetles emerge from their hiding places early in the evening and continue work during the early part of the night. If the tree upon which they are working is gently shaken they will drop to the ground and feign death. This can be taken advantage of, and millions can be shaken from the trees into sheets spread beneath, and then dropped into a tin of paraffin and killed. The process must be continued every night while the plague lasts, for fresh beetles are emerging from the soil each day, and will reinfest the trees.

Instead of sheets, an elaborate apparatus has been devised, built of sheet iron on a framework of wood. The whole affair resembles a huge umbrella turned wrong side up. One section is open, and allows it to fit into the trunk of the tree, which corresponds to the handle of the umbrella. The sloping sides lead into a narrow trough at the centre, which is full of paraffin. It is provided with a pair of handles for carrying it from tree to tree. This arrangement is placed beneath the tree, which is then shaken, and the beetles roll down into the trough of paraffin at the centre, where they are killed. It is then removed to another tree, and the process repeated.

(*c*) The third method of dealing with the beetles is to spray the trees. For this purpose arsenical sprays are the best. Paris green, at the rate of 1 lb. to 200 gallons of water, with two pounds of freshly slaked stone lime added, is very good, but is a little slow in killing the beetles. A cheap arsenical spray is made by boiling together 1 lb. of white arsenic with 2 to 4 lbs. of freshly slaked *stone* lime, in a couple of gallons of water, for 40 minutes, and then adding it to 200 gallons of water. This produces what is known as arsenite of lime. Either of these sprays can be made much stronger, providing more lime is added. The purpose of the lime is to take up the free arsenious oxide, which may be present in arsenical compounds, thus making it insoluble in water, and preventing the burning of the foliage or fruit. An addition of extra lime will ensure perfect safety. There need be no hesitation in using the above sprays. All of them are insoluble in water, and the first heavy rain washes all traces from the leaves and fruit.

For vines, a spray of arsenate of lead would be best. This spray can be made of any strength, and will not injure foliage in the least. It is not recommended for trees bearing fruit, because it sticks very thoroughly, and is not so easily washed off as the two sprays first mentioned.

Arsenate of lead is made by dissolving in six bottles of water 11 ozs. of acetate of lead (sugar of lead). In another vessel 4 ozs. of arsenite of soda are dissolved in three bottles of water. The arsenite solution is then poured into the lead solution and stirred. A milky

fluid results, which should be mixed with 50 gallons of water before spraying. Excellent preparations may be purchased, in paste form, which need only be mixed with water before using. Arsenate of lead contains less arsenic than Paris green or the arsenite of lime, and must be consequently used stronger. It is principally employed where tender foliage is to be sprayed.

In applying the sprays for a very small orchard the "Success Bucket Spray Pump," such as is used in the destruction of locusts, is quite useful, but for a large orchard something more powerful must be used. For this purpose "Meyer's Improved Brass Barrel Spray Pump," or "Meyer's Power Spray Pump" are recommended. The former can be fitted into a barrel, and, with the extension rod fitted to a hose, and provided with the Bordeaux nozzle, gives very good results. The latter is a more powerful pump, and more serviceable for a large orchard.

* * * *

II.—Remedies against Grubs.

(*a*) Many methods have been devised for killing the grubs, most of which are impractical on a large scale, especially where so small an amount of land is under cultivation as in the Transvaal. Many of the grubs, however, are present in the orchard, where they will later do injury as beetles, consequently frequent ploughing and cultivating throughout the year (at least once a month) will turn out and destroy many grubs, besides benefitting the trees in other ways. A flock of fowls, if let loose in the orchard when the ploughing is going on, will help to complete the work of destruction. This method, together with spraying for the beetles, are the two which have given the best results.

(*b*) Fertilizers, such as nitrate of soda, if used rather abundantly, will destroy many grubs in the soil.

* * * *

FLOWER BEETLES.

There is another group of beetles, known technically as *Cetonids*, which are very fond of flowers, but sometimes attack ripening fruit, such as plums and peaches. These beetles are larger than cockchafers, flattened and rather five-sided in outline. The body is usually shiny, and often marked with spots and stripes of yellow, green or red.

The life history of these beetles is much the same as that of the cockchafers, except that the grubs are more hairy, and usually feed upon manure and other decaying matter in the soil rather than the roots of plants. The beetles are especially fond of such flowers as dahlias, sunflowers and perennial coreopsis, so that where they are in the habit of attacking ripening fruit, a quantity of these flowers would act as a trap, and from them the beetles could be shaken into a tin each day and destroyed with paraffin. We have also found that fruit sprayed with a plain wash of lime is never attacked, but the sprays recommended for the cockchafers would be more effective.

The California Red Scale.

Chrysomphalus aurantii, Mask.

Found in almost every citrus orchard in the Transvaal.

SUMMARY.

For destroying cockchafers, shaking from the trees or spraying the trees are the best methods to be adopted against the beetles. For killing the grubs, frequent and thorough cultivation of the soil is most effective. Like many other South African pests, however, these beetles are very difficult to keep in check, and it is only by persistence in the above methods that the hoped for results can be attained.

No. III.]

THE FUMIGATION OF NURSERY STOCK AND GREENHOUSES.

BY F. THOMSEN.

Two fumigation houses have been erected by the Transvaal Department of Agriculture, one at the Goods Shed near the Customs House, at Pretoria, and the other at the Kazerne, at Johannesburg. They are used for the fumigation (with hydrocyanic acid gas) of plant and fruit imports.

Consignments of trees, plants, fruit or seed from oversea, or from any other South African Colony, which appear to be in any way unclean, or are suspected of conveying insect pests, have to pass through these houses for fumigation. This is done to prevent, as much as possible, any insect pests from entering the Transvaal. It is also done to safeguard the public, for it stands to reason that people who want to plant trees or other plants, or who wish to lay out an orchard, for example, should have nothing but the cleanest of stock, and not find, in a few years' time, that they have to go to a lot of expense for replanting or cleaning.

Before any nurseryman, *outside* the Transvaal, can forward any plants, it is necessary that his stock be found clean and healthy, and also he must have a fumigation house on his premises, where all the outgoing consignments are fumigated, or he will be unable to obtain permission to forward to the Transvaal.

The same law is in force *within* the Transvaal. All nurseries are inspected, and this Department insists on the erection of fumigation houses; for although the plants in a nursery might be apparently clean and free from insect pests, it is advisable, and in the interests of every nurseryman and florist, to pass the fruit trees and stronger plants through a fumigation house. The more tender stock can be sprayed. It is often stated that fumigated fruit trees suffer by this treatment. This is not the case if the plants are in a dormant state. In nearly every case in which such complaints were made it was found that the trees were either not planted properly or the termites had started to

eat the roots. On the other hand, complaints have been made that trees imported from oversea have suffered from the effects of fumigation ; but these complaints have been traced rather to the dried up condition in which the trees had arrived than to the effects of fumigation ; indeed some consignments have arrived in such a dried up condition that it is impossible for them to put on any growth after planting.

* * * *

Plate 7A, Fig. 1, will show how the fumigation houses of the Department of Agriculture are arranged. They are ordinary wood and iron buildings, lined inside with plain galvanized sheeting, there are shelves on each side with movable trays, one of these can be seen standing against the door. Fruit or small plants are spread out on these trays for fumigation. The door is tight fitting and shuts against narrow strips of felt, a small window, which opens from the outside, is opposite the door, high up in the wall. This allows easy and safe ventilation.

The dimensions are 10 ft. long by 10 ft. wide by 10 ft. high on the one side, sloping down to about 9 feet. The cubic contents are 1,080 cubic feet.

This kind of building can be recommended to everyone who wishes to erect a fumigation house. The cost is not very high.

* * * *

I should mention here that most of the leading Transvaal nurserymen have erected fumigation houses on their premises. Some of these are small brick buildings, of about one thousand to two thousand cubic feet content, and others are wood and iron buildings.

Plate 7A, Figs. 1 and 2, will show one of the latter. This house is lined all over the inside with ceiling boards on which brown packing paper is pasted, and this seems to answer very well. Care should be taken that all cracks, which are likely to occur owing to our dry climate, should be papered before each fumigation is to be carried on. Opposite the door is a small window for ventilation, shelves are erected all round, so as to have the plants, etc., well up from the ground. The fumes of the hydrocyanic acid gas are very light, and will naturally be more effective in the higher parts.

The fumigation is done as described in the article for house fumigation, and I will simply repeat here some of the more important points.

1. Measure the cubical contents of the house by multiplying the width by the length by the heighth.

Plate 7A.

Showing Methods of Fumigation.

FIG. 1.—Fumigation of Nursery Stock.
FIG. 2. Plants arranged for treatment.
FIG. 3.—Dishes for Cyanide and Acid.

2. For every hundred cubic feet space take one ounce of cyanide, one ounce of sulphuric acid, and three to four ounces of water. This is for dormant fruit trees. Three-quarters of an ounce of cyanide, three-quarters of an ounce of sulphuric acid, and two and a half ounces of water, for trees in leaf, palms, etc.

Half an ounce of cyanide, half an ounce of acid and two ounces of water for softer plants.

3. Do not have the plants wet.

4. Never use more than three to four ounces of cyanide in one dish.

5. First put the water into the dish, pour in the necessary amount of sulphuric acid, slowly, then, having first taken the precaution to place the cyanide in a paper bag, drop the paper bag into the liquid and close the door. Leave the door closed for from forty-five minutes to one hour, soft plants from twenty-five minutes to thirty minutes.

6. *Be very careful in handling the chemicals or in inhaling the fumes as they are highly poisonous.*

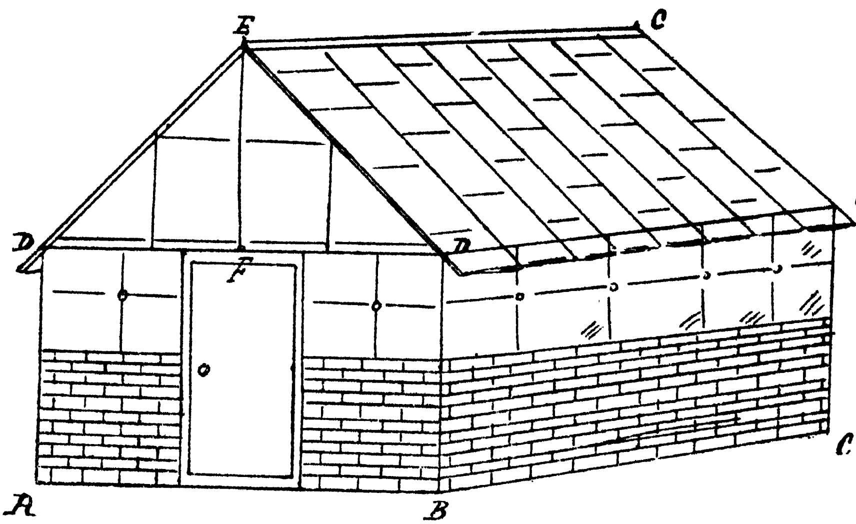
* * * *

It often happens that only one or two plants are to be fumigated, in this case it would be waste of material to use the big fumigatorium, and a box of about four feet by four feet by six feet (96 cubic feet content) may be used. A box of this description can easily be made airtight. Take an ordinary packing case as near the above dimensions as possible. Take out one of the smallest sides and nail down the lid, now paper inside with two layers of brown packing paper, or any other strong paper, or, better still, line the box out with some cheap calico and paste the paper over this. Fit the side in tight for a door, which can be held in with two battens, nailing a strip of felt on the inside edges to make sure that no fumes escape. The fumigation box can be kept inside the large fumigation house, and can be used as part of the shelving. The quantities of material to be used should be as those given for 100 cubic feet.

Insects are very fond of greenhouses. The even temperature and constant moisture is very favourable for the hatching of all kinds of insects, should any of their eggs find their way in. Many species of scale insects, mealie bug, moths, etc., can very frequently be found in a greenhouse. Fumigation with hydrocyanic acid gas is a good remedy, but it must be used with care. Some plants are very sensitive to the fumes. Greenhouse plants must only be left for a short period under the influence of the fumes, and the gas must therefore be formed quickly, and in as many places as possible, to ensure an even distribution.

To fumigate a greenhouse with hydrocyanic acid gas we proceed as follows :—

First find the cubic contents of the hothouse.



The drawing above will explain how to do this. All measurements must be taken inside. Multiply the width AB by the length BC by the heighth AD. Then multiply the width DD by the length DC by half the heighth EF, add the two sums, this will give the cubic contents of the whole house.

The glass roof, unless very well constructed, must be covered, either with some cloths or matting or bucksail, otherwise the fumes will find their way out between the glass panes. The door should fit tight, and if the frame is worn out under the door a few spadesful of earth can be thrown against the door from the outside, all other openings must be closed with bags or paper.

Plate 7A, Fig. 3, shows the arrangement of the dishes inside the greenhouse.

If there are only roses, palms, azaleas or other strong plants use three-quarters of an ounce of cyanide, and the corresponding quantities of sulphuric acid and water for every 100 cubic feet space. For softer plants, such as ferns, araucaria, conifers begonia, coleus, etc., half an ounce of cyanide for every 100 cubic feet is enough. Do not gasify more than three or four ounces in one dish. Thus, if a greenhouse contains about 5,000 cubic feet, 25 ounces of cyanide would be the quantity for soft plants, and at least eight dishes should be used.

Leave the plants under the influence of the fumes for not longer than 30 minutes and then ventilate well.

Mr. Chas. P. Lounsbury, Cape Government Entomologist, writes under "Hydrocyanic Acid Gas for Greenhouse Fumigation," in his report for the year 1898 :—

"An officer of the U.S. Department of Agriculture has been experimenting off and on for the last four years with hydrocyanic acid gas as an insecticide for the destruction of various kinds of insect pests which affect plants in glass houses, and following his lead a number of gardeners have adopted this fumigant. It is said that it has been found possible to destroy every insect without destroying a single leaf or flower. Even mealie bugs are said to be destroyed without injury to so delicate a plant as coleus." A description of the process taken from an American source was published in the "Gardners Chronicle," for July 16th last, and from this I glean the following particulars :—

"Three parts of acid to two parts of boiling water is used, and the cyanide added whilst the acid water is bubbling with heat, this secures a very rapid evolution of the gas, and necessitates the use of a large generating dish to prevent slopping over the sides. The exposure is a short one, the house being opened as much as possible from outside as soon as twenty-five minutes have elapsed. For each cubic foot of free space enclosed, one and eight-tenths grains of cyanide are used, which, if troy grains are intended, as seems most probable, is equivalent to one avoirdupois ounce to 200 cubic feet (half ounce to 100 cubic feet).

"All damp must be driven out of the house, and the plants should be quite dry in their foliage before commencing to fumigate them with the cyanide, because if there is any moisture on the leaves they are liable to become scorched. All being dry and in good order the process may be carried out with perfect safety to the plant ; and houses full of roses, palms, ferns, violets, carnations and other tender plants and flowers have been treated as described with the most successful results, the insects being destroyed and neither flower nor leaf hurt in the least."

* * * *

It will be seen from the foregoing extract that the writer recommended three parts of sulphuric acid to two parts of boiling water. This last I believe is not necessary, because as soon as the acid is poured into the water, which, bye the bye, should always be done, and not the water poured into the acid, a very great heat, often reaching 250 to 280 degrees Fahrenheit, is generated. If no time is wasted in dropping the cyanide (in a paper bag) into the hot mixture, nearly the same result will be obtained, namely a quick and thorough gasifying process.

It will also be noticed that 25 minutes are recommended as a safe time for soft plants, though to get the full benefit of such an exposure the fumes must be created in as many dishes, evenly distributed, as possible. Rather have two or even four dishes too many than be short

of the proper number. Again, another point which must not be overlooked is mentioned. Your plants inside your greenhouse must be dry. Keep your house dry for a day or, if possible, two days, with plenty of ventilation, and water your plants immediately the house is well aired after fumigation.

In greenhouse fumigation it is well to remember that the eggs of insects, which are often laid well hidden in cracks, under bits of bark, or even in the ground, or under flower pots, escape the poisonous influence of the hydrocyanic acid gas, and a second fumigation will often be found necessary in about fourteen days' or a month's time.

The cost of fumigation is so small that every florist or nurseryman or owner of a greenhouse can avail himself of the benefit to be derived from fumigating. Only the necessary care in handling and storing the poison must be strictly observed. Always keep the cyanide and the acid, as well as the implements used in fumigating, under lock and key. The cyanide and acid must also be placed in an air tight receptacle, and a label, stating the nature of the contents, with the word "poison" on it fastened outside. Any room under fumigation should be locked and watched, and children and natives especially should be warned against attempting to enter it.

Before closing this article I should particularly like to draw the attention of Transvaal nurserymen to the fact that all nursery stock, which has to leave this Colony for other parts of South Africa, must be fumigated ; and it would therefore be to the interest of those who have not already erected fumigation houses to have one erected, as not only is this required by the regulations, but it is in the interest of the public in general that nothing but clean stock should leave their nurseries.

The Entomologist will always be ready to give advice and assistance to novices in the art of fumigation whenever possible, and as time permits.

Cyanide of Potassium can be obtained from this Division, in not less than 5 lb. lots, at 1s. 6d. per lb. A remittance should in every case accompany the order for this material.

Sulphuric Acid.—Upon enquiry the name of firms who sell this chemical in large or small quantities will be forwarded.

THE TOBACCO SECTION.

NOTES FOR THE GUIDANCE OF FARMERS SENDING TOBACCO PLANTS OR LEAVES FOR EXAMINATION.

By J. van Leenhoff, Government Tobacco Expert.

(1) Preparation of Tobacco Leaves and Plants Attacked by Insects.

All specimens should be packed in boxes. If leaves and insects are packed in letters they are likely to become crushed before arriving here, and in such a condition that the true nature of the damage cannot be determined.

A few of the insects should always accompany the leaves and plants if any insects have been found on the specimens. By this it is not meant that the first insects seen upon the plant should be enclosed, because if the farmer wishes to obtain accurate recommendations regarding the treatment of diseased plants he should make as careful observations as possible, so as to determine just what insects do the damage. It would be well if the specimens were accompanied by a description of the disease or the insect, and further by a statement of the conditions under which the plants were grown, the nature of the soil, the amount of moisture present, and so on.

(2) Preparation of Diseased Leaves.

Diseased leaves forwarded for examination should be packed singly between blotting paper, or any fairly absorbent material.

Insect Pests.

The plants must be carefully examined daily for insects. A solution of Paris green and lime in the proportions of 1 lb. Paris green, 2 lbs. lime, 150 to 200 gallons of water should be applied to all plants, once every fortnight until the topping season arrives, as a preventive for insect pests.

Preparation of Paris Green.

To prepare the solution : Place the required proportion of Paris green in a linen bag and suspend it in a bucket of water on a stick

placed across the top of the bucket. The lime must be treated in a similar manner, and both left over night or until the chemicals have dissolved, then stir the contents of each bucket well and pour the whole into a barrel containing clean water, making up the total quantity of solution required. Thoroughly stir the whole and apply with a spray pump.

* * * *

Eelworms in Tobacco Plants.

This worm breeds in the roots, but the eggs are secreted far and wide in the ground, so that the soil remains infested for many years. This is especially the case when weeds are allowed to grow. It has been said that the treatment of the ground with chemicals is an almost hopeless task, and would probably cost more than the ground is worth.

Some success has been obtained by treating the ground with copper sulphate (blue vitriol), but apparently the only method to obtain relief is to plant root crops such as carrots, parsnips, turnips, etc. When this is done the worms will burrow into the roots, and when the roots are pulled the worms come up with them, and therefore have no opportunity of laying their eggs in the soil.

This method has been tried with success in many countries. It has been definitely proved that these worms, if fed to stock in carrots, etc., will pass through the animals unchanged, and if the manure is used on the lands it will re-infest the soil with these worms. Under no circumstances, therefore, should such manure be used for fertilising the ground.

The insect in question is a true worm, and representatives of this family attack nearly every kind of plant, and are especially injurious to clover, wheat, barley, oats, tomatoes, cucumbers and tobacco, and they sometimes attack fruit trees.

Eelworm experiments will be conducted by the Tobacco Division in conjunction with the Entomological Division as soon as possible.

Split Worm.

The split worm is quite commonly distributed throughout the Transvaal, and causes great loss. If tobacco plants are badly infested the best plan is to cut them off below the infection or to totally destroy them. The eggs of this moth are laid upon the leaves of the stem. The young larvae penetrates the tissue of the leaf and eats the interior or produces a gall-like formation under the stem of the young tobacco plant. The ravages of this insect may be prevented if the tobacco seed beds are sprayed with Paris green.

The spraying must be repeated every ten days. This remedy has been applied with great success.

A FEW TOBACCO DISEASES FOUND IN TRANSVAAL TOBACCO SENT IN FOR EXAMINATION.

(a) *Peronospora hyoscyami.*

Peronospora hyoscyami invades the cotyledones (first leaves) and root system. The fungus Peronospora thrives best in damp situations, and spreads very rapidly from plant to plant where excessive watering is practised. Plants once infected are doomed, and one can only hope to prevent the spread of this disease in the beds by allowing the seedlings to get as much light and aeration as possible. It would not be safe to sow these beds again until the soil has been thoroughly sterilised.

(b) *Fungus Alterneria.*

Found in tobacco leaves showing brown spots.

A spraying with dilute Bordeaux mixture will check the disease. The spray should be applied with as little delay as possible, the best time to spray being after rain, and should be repeated every nine to ten days until the disease shows no signs of spreading.

(c) *Ascochyta nicotianæ.*

Practically nothing is known concerning the methods of control of this pest, and, judging from specimens of leaves submitted, it would appear to be rather a serious disease, and great care should be taken to prevent its spreading. It is quite possible that judicious fertilizing would increase the vigour of the plants and render them less susceptible to the disease. The use of a fertiliser containing a rather large percentage of potash, and, if the soil is soggy, careful attention to drainage might be beneficial. Diseased leaves and all refuse from a diseased crop must be burned.

(d) *Oidium Tabaci Thum* (White Rust or Mildew).

If this appears in the beds, dusting the foliage with sulphur, mixed with one-sixth its quantity of quicklime, will check the disease. When appearing in the field, see p. 24, "Agricultural Journal," No. 17, October, 1906, "Some Notes on Tobacco."

Sterilization of Soil.

In tobacco beds the sterilization of soil is important, and can best be brought about by watering the soil with a solution of the liquid known in the trade as Jey's Fluid, in the proportions of 1 ounce of the liquid to a gallon of water. The soil should be thoroughly wetted through and allowed to remain for a week before anything is sown or planted. As a precaution against the disease when the plants are up spraying with Bordeaux mixture is recommended.

PREPARATION OF BORDEAUX MIXTURE.

Bordeaux mixture is a preventive and check for fungus diseases, and is prepared in much the same manner as Paris green, but great care must be taken to avoid applying too strong a solution. The strength of the solution must be tested before it is applied to the plants.

The plants must not be sprayed in the heat of the day, and, as far as possible, spraying should be avoided when there is a likelihood of immediate rain washing the solution off the leaves before it has taken effect.

The method of preparing Bordeaux mixture is as follows :—

When used as a preventive :

Water	50 gallons.
Copper sulphate	3 lbs.
Unslaked lime	2 lbs.

When fungus disease is present the solution should be one hundred per cent stronger, *i.e.* :

Water	50 gallons.
Copper sulphate	6 lbs.
Unslaked lime	4 lbs.

In a barrel or other suitable vessel place 25 gallons of water. Weigh out three pounds of copper sulphate and tie it up in a piece of coarse gunny sack and suspend it just below the surface of the water. By tying the bag to a stick across the top of the barrel no further attention is required. In another vessel slake 2 lbs. of lime, being careful to obtain a smooth paste, free from grit and small lumps. To accomplish this it is best to place the lime in an ordinary water pail and add only a small quantity of water at first, say a quart or a quart and a half. When the lime begins to crack and crumble and the water to disappear add another quart or more, seeing that the lime at no time gets too dry ; towards the last considerable water will be required, but if added carefully and slowly a perfectly smooth paste will be obtained, provided, of course, the lime is of good quality. When the lime is slaked add sufficient water to the paste to bring the whole up to 25 gallons.

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When the copper sulphate is entirely dissolved and the lime is cool, pour the lime milk and the copper sulphate solution slowly together into a barrel holding 50 gallons. The milk of lime should be thoroughly stirred before pouring. The method described ensures good mixing, but to complete this work the barrel of liquid should receive a final stirring for at least three minutes with a broad wooden paddle.

It is now necessary to determine whether the mixture is perfect—that is, if it will be safe to apply it to tender foliage. To accomplish this two simple tests may be used. First insert the blade of a penknife into the mixture, allowing it to remain at least one minute. If metallic copper forms on the blade, or, in other words, if the polished surface of the steel assumes the colour of copper plate the mixture is unsafe and more lime must be added. If, on the other hand, the blade of the knife remains unchanged, it is safe to assume that the mixture is as safe as it can be made.

As an additional test, however, some of the mixture may be poured into an old plate or saucer, and while held between the eyes and the light the breath should be gently blown upon the liquid for at least half a minute. If the mixture is properly made, a thin pellicle, looking like oil on water, will begin to form on the surface of the liquid. If no pellicle forms more lime should be added.

It is very important to remember that air-slaked lime should never be used in the preparation of Bordeaux mixture, since its use results in injury to the foliage. The adhesive property of Bordeaux mixture is much increased by adding soft soap in quantity equal to that of copper sulphate. This is especially necessary when spraying smooth or waxy leaves, the soap increasing the tendency of the liquid to spread instead of forming into large drops which roll off the surface of the leaves.

EXTRACTS FROM EXCHANGES.

ON THE QUALITIES OF A FLEECE.

(Minnesota Farmers' Institute Report.)

The best way of arriving at an estimation of the nature of a fleece is to open it first just over the shoulder. It is in this region that the finest and best wool is to be found. By using the hands in a flat position, instead of sticking the fingers into the wool, the fleece may be parted in a nicer way. After looking at the wool and skin in this region, the thigh should be chosen for the next examination. This part usually grows the poorest and coarsest wool of the whole fleece. Then the covering of fleece on the belly must also be noticed. By examining the fleece in these three places a fair estimate may be made as to its quality.

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Density.

The density of a fleece means the closeness of the fibres. Technically, it means the number of fibres that grow on a square inch. Density is not only of value in order to secure a heavy fleece, but, from a breeder's point of view, its chief importance lies in the fact that it is more protection to the sheep than a fleece that is open. Not only is a sheep with a loose, open fleece more liable to contract a cold from exposure to rain or wind, but it is also more apt to yield a dirty fleece, as the loose fleece catches the dirt and dust and pieces of hay and straw. From the shepherd's point of view, the denseness of the fleece is its leading feature, for it will be found that those animals with dense, close fleeces are less subject to such diseases as catarrh, running at the nose or scouring. When a sheep is chilled the circulation is at once affected, and the blood is sent to the internal organs and inflammation is set up and scouring begins. This is why sheep that have open fleeces are more subject to such diseases than those that have dense fleeces. Wool is one of the best non-conductors of heat that we have, and when it is on sheep in the form of a dense fleece, it gives them the greatest possible protection from exposure.

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Length of Staple.

The length of the staple is an important feature, both from a commercial point of view and from the shepherd's standpoint. Wools

are generally known as *short stapled or the carding wools*, which are used for woollen cloths ; and *long stapled or combing wools*, which are used for worsted clothes. The long stapled wools include the Lincoln, Leicester, Cotswold, Romney Marsh, and Black Face or Highland. The short staples include that of all the Downs—Southdown, Hampshire, Oxford, Cheviot and the Welsh. The basis of this classification is plain, and the reasons for it are readily understood. The manufacturer of wools desires a short stapled wool, for such a wool has better felting qualities, and usually more serrations or spirals than the long wools. The idea being to produce the yarn in which the fibres are transversely disposed to the axis or length of the thread. On the other hand, in worsted goods, the object is to stretch the fibres and lay them parallel with each other, and this produces a yarn, even, strong and composed of as fine fibres as possible. In this process of manufacture it is easy to see that the length and strength of a fibre comprises its most valuable characteristics.

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Softness.

The softness of the fleece depends not only greatly on the management, but also on the nature of the food and of the soil. In reference to the foods, those that are rich in sulphur have been observed to have the most influence on the softness of the wool. It is interesting to know that in one hundred pounds of wool there is at least five pounds of sulphur, and it seems that the abundance of this in the food has an effect on this feature of softness in the fleece. It is well known that soil has a strong influence on the properties of wool, especially in regard to its softness. Clay soils are considered to produce the softest wool, of the best lustre, and next to those rank sandy soils, and lastly those of the nature of limestone. Chalky soils have been noted for the deterioration they produce in the softness of wool. Harshness of the fleece is generally due to an absence of yolk which has resulted from ill-health on the part of the sheep, or from exposure. If you will consider the nature of the fibre of wool, it is easy to understand how anything, such as ill-health or exposure, which affects the secretion of yolk, is certain to make the wool harsh. A fibre of wool is covered with a series of scales which overlap one another like the shingles on a house. When the secretion of yolk is abundant these scales fit closely to the fibre ; but when the secretion of yolk is stopped from any unnatural cause, the scales stand out from the fibre like warped shingles on a roof. The result of this is that the fibres lock, and when you feel the fleece that has fibres of this nature they seem to grate each other just as file shavings. The wool is harsh and dry, and when pressed it gives that grating feeling which is characteristic of an unhealthy fleece. It is this condition that produces what is generally known as rotted fleece.

Crimp.

All wool is more or less crimped, known as spirals. The most important point in regard to the crimp is that it should be regular ; indicating that the fibre is sound from end to end, but if in some places the crimp is short and close, and in others long and wavy, it indicates that where this difference occurs there is an unsound spot in the fibre. It shows that the growth has been irregular. Now there is a close relation between the fineness of the fibre and the nature of the crimp. Where the crimp is fine and close the fibre will almost invariably be found to be of fine quality. In all coarse wool it will be noted that the crimp is open and wavy. In opening a fleece and looking at it, the crimp should always be observed, from which an accurate estimation may be made, both as to soundness and fineness.

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Purity.

Purity refers to the freedom of the fleece from dead fibres and foreign matter. In fleeces grown on sheep that are exposed to hard conditions there is a natural tendency for the fleece to revert to its original condition ; that is, fibres of hair begin to appear in it, and these take the place of the wool. Very often in fleeces on sheep that have been exposed many dead fibres are found which are technically spoken of as kemp. These dead fibres are very injurious to the fleece from the commercial standpoint, because they do not absorb dyes, and in any cloth that is made from such wool all these dead fibres retain the white and hard appearance that they had in the fleece.

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Lustre and Brightness.

This refers to the glistening appearance of the fibre when held to the light. This is independent of the amount of yolk, and it is also quite distinct from the brightness of the fibre, yet all lustrous wools have this characteristic, independent of the amount of yolk that is present. The chief advantage from a commercial standpoint is that lustrous wools more readily take the delicate dyes. Wools in the market are known as lustrous or dull, according to the appearance of the fibre. The lustrous fibre has the appearance of having been varnished, while a dull one does not show the least tendency to glisten when held in the light. Brightness is quite distinct from lustre, as it refers to the colour of the wool. In the market wools are said to be bright or dark. The bright wool is one that has a clear white colour, while a dark wool is one that has become discoloured from the soil on which the sheep have ranged, or it may be through pasturing them among burnt stumps.

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Yolk.

Yolk is the grease or oil that is naturally secreted by the skin. Yolk in the fleece is an indication of the healthiness of the sheep. It

is secreted in the skin, but passes through the fibre and finds an outlet at the end of the fibre. If you notice sheep on certain days when the weather is close and the sheep are sweating, the yolk seems to accumulate on the end of the fibre, and if you run your hand over the fleece you would then find it quite oily. The yolk comes out at the ends of the fibres mostly, and works back into the fleece. In some flocks the quantity of yolk has been increased and encouraged by selection, so that heavy fleeces are obtained. The ordinary fleece, in which yolk is abundant, in proper quantities, will lose nearly one-third through washing it in hot water. This grease is of no value to the manufacturer, and it represents a direct loss to him when it is in the fleece in too large quantities. The feeding and the management undoubtedly influence the amount of yolk. Feeding sheep foods that are rich in oil seems to further the secretion of grease, and especially in feeding with such rations as are generally given in fattening sheep the quantity of yolk seems to increase. In our work in fattening lambs, we have found that those which receive grain from birth invariably sheared heavier fleeces than those that had grain only during the last three months of fattening. By washing samples of those fleeces of sheep, we found that the increased weight of the fleece was almost altogether due to the increased amount of yolk which the grain-fed lambs secreted. The presence of yolk in proper quantities is of much importance, because the fleece is softer. It becomes more compact and remains bright and clean, moreover yolk is a safe index of the thriftiness of the animal.

REGISTRATION OF STALLIONS IN WISCONSIN.

(*University of Wisconsin Agricultural Experiment Station, Bulletin* 141.)

With a view to the improvement of horse-breeding in Wisconsin, the Legislature of that State has recently adopted a system for the registration of stallions, by which every person keeping a stallion for profit is required to obtain a license certificate from the Department of Agriculture. In order to obtain this certificate the owner, besides furnishing the pedigree, etc., of the animal, has to declare on oath that the stallion is, to the best of his knowledge, free from hereditary, contagious or transmissible unsoundness or disease, or else to furnish a certificate of soundness signed by a qualified veterinary surgeon. The law only came into force in January, 1906, so that sufficient time has not yet elapsed for the benefits of the system to be apparent, but it is said to have had a valuable effect in directing the attention of farmers to the importance of using sound sires. New departures and improvements in old-established industries come by education rather than by the enforcement of stringent legal measures, and the law was regarded to a large extent as educational. Owners were given the

privilege of either making an affidavit of the soundness of their horses or obtaining a veterinary certificate, as it was thought that this plan would at least draw attention to the importance of soundness in breeding animals, eliminate some of the unsound sires, emphasize the need of sound brood mares, and, in time lead to more stringent and effectual methods of examination. The law has already had beneficial results by retiring from service upwards of *one hundred unsound stallions*, and by provoking discussion on the subject. The average farmer, however, shows little disposition to patronize the pure-bred stallion in place of the common non-pedigree animal, so long as a higher service fee is charged for the pure-bred than for the other horse.

A number of suggestions are made with a view to improving the present law; for instance, as no provision is made for the renewal of the license certificates, it is proposed that they should be required to be re-issued annually or biennially. The adoption of a list of diseases to be considered "hereditary, transmissible, or communicable" is recommended, and provision for a proper system of State veterinary inspection.

OSIER CULTIVATION IN HOLLAND AND BELGIUM.

("*The Journal of the Board of Agriculture*," *April*, 1907.)

The varieties of osier most commonly grown in Holland and Belgium are *Salix viminalis* (the cane osier), *Salix triandria* (Black Hollanders and similar kinds), and *Salix purpurea* (the Welsh osier). The largest yield is obtained from *Salix triandria*, then from *Salix viminalis*, the smallest yield being got from the other variety, which is used for finer basket work. They are largely grown as a distinct crop on low-lying lands near rivers and streams, in the same way as in the Fen district in England. In preparing an osier plantation the land is very thoroughly worked, being dug with the spade some 20 to 30 inches deep. Wet land must be drained, as, although moisture is required, osiers will not thrive in standing water. Manure is rarely applied in Belgium or Holland. The planting of the sets takes place from the end of February to the beginning of April. Three-year-old rods are usually employed; they should be two or three yards long, and well provided with buds. Some growers prefer one or two-year-old rods, and there is no accepted rule as to which is best. Each of these rods is divided, according to its length, into several pieces. These are the sets, and should be from 1 ft. to 20 in. in length. It is recommended that they be planted as deeply as the soil has been dug; if it has been dug 20 in. deep or more, longer cuttings should be used. This is not with the object of forming stronger roots. but to establish the plant more firmly in the ground, and to guard against its being blown about by the wind.

Three or four buds may be left above the surface, but on light soil the cuttings may be entirely covered over, as the young shoots will easily push their way towards the light.

The distances at which planting is done varies very considerably, depending on local custom and the purpose for which the osiers are to be used. If strong rods are required, to be cut only every three or four years, planting may be done at distances of 36 by 32 inches, or of 32 by 32 inches, or of 27 by 27 inches. Osiers for annual cutting may be planted at distances of 24 inches by 27 inches or even closer.

During the first year the ground should be hoed and kept free from weeds. Where the sets are planted wide apart, potatoes and roots are sometimes grown between ; occasionally also fruit trees are planted with them. The cutting of the rods takes place in winter, from November to March. Sometimes cutting is done even in the first year after planting, and thereafter annually until the plant is worn out. By this method, which is much followed in Belgium, thin one-year rods are obtained. If stronger roots are wanted, only some of the shoots from the young plant are removed the first year, leaving seven or nine of the strongest, which remain for two, three or four years, according to requirements. This may be regulated to suit the demand. When the crop begins to fail the osiers are cut every year till they are exhausted. The duration of such a plantation varies considerably, according to the soil, method of cutting, etc. Where it is cut over every year it may last from twelve to fifteen years, or, at the most, for twenty years, but where cutting is done only every three or four years it may last for fifteen to thirty years, or even much longer.

ENDOWMENT OF EXPERIMENT STATIONS IN THE UNITED STATES.

(" *The Journal of the Board of Agriculture*," *April*, 1907.)

The value of agricultural experiment stations of the United States has recently been recognised by Congress by an Act known as the " Adams Act," which was passed in 1906. It provides that each State and Territory shall annually receive from the National Treasury a grant of money in addition to that given for the establishment and maintenance of the stations by the Act of 2nd March, 1887 (Hatch Act). The initial appropriation to each State under the Adams Act is £1,000 for the fiscal year 1906. To this amount £400 is to be added each year for five years, after which an appropriation of £3,000 is to

be made annually. Thus, in 1911, and each year thereafter, each State will receive £3,000, in addition to the £3,000 hitherto granted under the Hatch Act.

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The new Act considers that the stations are thoroughly organized and equipped, and therefore has for its sole object the extension and strengthening of the experimental work. The additional funds are "to be applied only to paying the necessary expenses of conducting original researches or experiments bearing directly on the agricultural industry of the United States." The Secretary of Agriculture, in commenting in his report for 1906 on the Act, observes that the Adams Fund is thus essentially a *research fund*, and if properly used should produce results of the greatest and most permanent value to American agriculture. The State experiment stations have already performed service of great value. They have done much to secure radical and widespread improvements in agricultural practice; they have contributed in a large measure to the creation of a new American literature of agriculture, and made it available to every farmer; they have collected much of the material from which a science of agriculture is being formulated as the basis for the instruction of successive generations of farmers in colleges, schools and farmers institutes. Pressure of work in other directions has limited the amount of original research, but the Adams Fund will now enable development to take place in that direction. Apart from the revenue received from the National Treasury, grants are made to the stations by the respective States and by various local bodies.

RURAL REPORTS.

Bethal.

April.—A few steady rains have fallen during the month. Towards the end of the month there were slight frosts and dry mists in the mornings; during the day, however, the weather was warm and pleasant. Harvesting is in full swing. The crops are, generally speaking, good. On certain farms, however, the locusts caused considerable damage. The potato crop has not resulted so well as expected. Owing to harvesting on the farms, native labour is not plentiful; wages from £1 to £2 10s. per month and food.

May.—More rain than usual fell during this month. Cold winds from the west and sharp frosts towards the end of the month. Farmers are busy harvesting their mealies, which appear to give a good yield. The yield of crops on the whole are good. Mealies, 8s. per 200 lbs.; manna, 4s. per 100 lbs.; and oat-hay, 5s. 6d. per 100 lbs. Some farmers have trekked with their sheep to the winter veld.

June.—The weather has been very dry with strong winds, and continues cold, with sharp frosts at night. Farmers have been busy threshing mealies of which there has been a good yield. Potatoes are now being dug up and there is a fair crop. Stock are in good condition; grass and water are plentiful and should last through the winter. A number of farmers have cut and stacked some veld grass for winter feed. Machinery for shelling mealies is being largely used.

Boksburg.

March and April.—The weather on the whole has been cool and cloudy, with several windy days. The rainfall for March registered 2.56, and for April 4.17. Farmers generally have been busy with mealie and potato crops. A lot of new ploughing is going on all over the district, and much ground has been broken up in preparation for spring. From the middle of March up till the end of April large swarms of locusts passed over the district seriously injuring mealie and Kaffir corn crops, and, in many places, eating up the veld. Potatoes have come on well this season, and many farmers will have good crops of onions. The hay crop is a good one in most of the low-lying lands, although, in some places, it has been spoilt by the late rains. Fruit crops and cereals show a big advance on other seasons. Poultry is plentiful and cheap, and the market generally is well supplied all round.

May.—The rainfall for the month registered .05 inches. Weather cold and unsettled; windy and dusty during most of the month. Farming operations have been restricted and the cold weather has led to many farmers trekking to the winter veld. Fruit has been very scarce on the local market, and oranges and naartjes coming in from

the Magaliesberg District realised good prices. The hay crop this season has been a good one. Stock generally has suffered owing to the cold winds and frosty nights. The veld is looking poor owing to locusts and frost. Water is plentiful. There is no change in the labour supply to report. All the mines in this district seem to be fairly well supplied with white labour.

June.—Rainfall on two days. Light frosts have been frequent, and, on several occasions, heavy during night-time. Winds have been light and variable. Farmers in the district are now busy pruning and preparing orchards for the coming season. Plenty of fresh ground has been broken up. Cabbages and cauliflowers are fairly plentiful and cheap. Oranges and naartjes are still well supplied. The price of mealies ranges from 9s. 6d. to 10s. per bag ; potatoes, 6s. to 12s. per muid. Stock are in good condition.

Carolina.

April.—The meteorological conditions during the month were seasonable and favourable ; there was an average rainfall and no general frost. Winter is setting in this year at least a month later than last year. The veld remains in excellent condition, all streams are running strong, and the vleis are still full of water ; there is good grass in the winter veld. The mealies were harvested during the month, the yield, where the crop was not inundated, is above the average ; in the Gaol Reserve at Carolina, where the area under cultivation is about a morgen, the crop was 30 bags of mealies, with about 1,000 pumpkins. The ground had been well manured. The veld being still good, the winter trekking of sheep will not take place till late in May.

May.—There was a little rain during the month and the weather was warm till late in the month. The first heavy frost occurred on the 27th. Mealies were harvested during the month : on the High Veld the crop is a good one, and shows an advance on previous years ; in the Low Veld, however, a very considerable proportion of the crops was spoilt by rain, and the natives have had a spare harvest. Winter crops of oats and wheat have been sown on irrigated plots. Stock are in exceptionally good condition and should do well this winter.

Ermelo.

May.—Up to the 26th of the month mild summer weather was experienced. A slight frost occurred on the 7th which did no harm. The night of the 27th marked the advent of winter. Since that day winter weather has set in in earnest accompanied by cold westerly winds during the day and icy cold nights. The reaping and shelling of mealies have occupied the time of the farmers throughout the month. The mealie crop is considered to be a record one, and mealies are now selling at 9s. to 10s. per bag. Good crops of oat hay and manna have also resulted, with prices ranging from 15s. to £1 per 100 bundles, that is, 3s. to 4s. per 100 lbs. Some oranges have come in from the Low

Veld. Mr. R. Dell, in the neighbourhood of Davel, has been sowing his oats very much thinner than the usual practice, and excellent results have been obtained*. He finds the oat is fatter, and an increased crop per acre has resulted. He treated those oats, and, after washing and drying them in an oven, ground the seed by means of a coffee mill, and has produced very good oatmeal. The labour supply has been plentiful as regards the town area. Many farmers in the western portion of the district are, however, short-handed. Farm wages run from 10s. to 20s. per month.

June.—The weather during this month was pleasant throughout, bright sunny days following on extremely cold and frosty nights. The veld is dry and parched, the extreme cold preventing any growth of new grass which, owing to the moist state of the soil, would have grown readily had warmer weather conditions prevailed. The supply of labour has been fair. As a general rule it has been found that natives do not stay with the hard working agriculturist, but generally clear off to farms where little or no labour is demanded from them. The Resident Magistrate has assisted several farmers within the 3-mile radius from the town with prison labour for reaping purposes with excellent results. The farmers have been well satisfied with the manner and despatch with which the work was done.

Heidelberg.

April.—The rainfall has not been quite as much as desired, but more than has been the case for the last few years during the same month. New lands have been broken up owing to the late rains. Notwithstanding that the locusts have on several occasions eaten the green grass that had grown as a result of late rains, the veld has been improved by the rain so that winter feed for stock is better than it was expected to be. The current price of mealies is about 10s. per bag; potatoes, from 10s. to 15s. per bag; manna and oats, about 3s. 6d. and 5s. per 100 lbs. respectively. Stock are rather poor in condition owing to the locusts having destroyed the crops and grass. The labour supply is normal.

May.—No rain fell during this month. Frost set in very severely about the end of the month. Taking everything into consideration, the weather was mild for the month of May. Very little ploughing could be done on account of the earth being too dry. In some parts of the district crops appear to be better than was expected. As the locusts did much damage to the veld, mealie stalks and leaves, the prospects are not as good as desired.

June.—The weather has been dry and windy and rather cold. Only a little ploughing has been done on account of the soil being too dry. The market prices are about the same as last month. Stock are still in fair condition and water is still sufficient.

See Useful Facts: Thin Seeding in Dry Farming.—[Editor, T.A.J.]

KLERKSDORP.

April.—Phenomenal rains have fallen during the month, registering as much as 5.84 inches. The days have been temperate and the nights cool. Ploughing is still being vigorously pursued preparing virgin soil for next sowing season. Locusts are still in evidence in all directions. Farmers are expecting to reap moderate crops in spite of the locusts. The seasonable rains appear to have assisted a certain percentage of the mealies to mature although the stalks have been stripped, an incident which experienced farmers declare is exceptional. Live stock are in good condition. The veld is good and water is plentiful. The Schoonspruit has been in flood twice during the month. There is no difference in the labour market. Burweed has been much in evidence during the past rainy months, and farmers have had great difficulty in keeping it down. Boring for water by means of Government jumper drills is still being carried out and excellent results are being obtained in some cases.

May.—During the first portion of the month the weather was temperate and rain fell registering about 1 inch. During the latter portion severe cold weather set in with cool southerly winds and frosts at night. Farmers are still busy putting in their winter crops. Fruit and vegetables are somewhat scarce. The market prices are as follows : Forage, 15s. to 33s. per 100 bundles ; Kaffir corn, 7s. 6d. to 11s. per 200 lbs. ; mealies, 9s. to 10s. per 200 lbs. ; onions, 7s. 6d. to 10s. per 123 lbs. ; potatoes, 9s. to 14s. per 160 lbs. ; tobacco, 2d. to 6d. per lb. There is a demand for white labour on the Rand mines at 10s. a day, and a number have been engaged from here.

LICHTENBURG.

April.—The rainfall for the month on eleven days registered 4.85 inches. Farmers are busy breaking up new lands for next year's mealie crop. The late rains have been very beneficial. The locusts have destroyed nine-tenths of the Kaffir corn crop in the district and a little more than half of the mealie crop. The current market prices are : Mealies (old), 10s. to 12s. per bag ; potatoes, 5s. 6d. to 17s. per bag ; oat-hay, 18s. to 25s. per 100 bundles ; vegetables are scarce and rising in price. The grass in some places has been cleared off by the locusts. No frosts have occurred as yet, and after the late rains the grass is coming on again. The two Government water drills at present in the district are doing excellent work.

May.—The rainfall on seven days registered .46 inches. From the 24th of the month onwards hard frosts with cold winds have been experienced. The maize and Kaffir corn crops are now being harvested. Kaffir corn is practically a failure, but, in many cases, the maize crop is turning out better than was expected, although the damage done by the locusts has been very great. Stock are in good condition. The grass has come on well with the late rains which have done a lot of good. Native labour is very scarce.

Middelburg.

May.—The weather has been cool and pleasant, dry and bright. Prevailing winds, north-east ; .08 rain fell on 27th ; few minutes snow on 30th, and one severe and several minor frosts occurred during the month. The early sown crops of oats have been severely damaged by locusts which makes re-sowing imperative. The harvesting of mealies concluded, but the crop is scarcely up to the average owing to the rust caused by heavy rains. Mealies can be obtained at 10s. per 200 lbs. ; wheat, 25s. ; forage, 5s. per 100 lbs. ; Kaffir corn, 10s. to 15s. ; potatoes, 10s. to 15s. ; beans, 15s. per bag ; cabbage, 3d. each. Live stock of all descriptions are in excellent condition. Water is plentiful and winter grazing good except on farms where locusts settled. Native labour is scarce—rate of pay 30s. per month.

June.—Many farmers, mostly working in a small way, utilised the "hollow" lands to a great extent, and, owing to the heavy and continuous rains, had their crops spoiled to a great extent. As regards manna, etc., a lot of damage was done by locusts. In some instances the farmer cut his crops in time and perhaps managed to save them, but in many instances again heavy losses occurred. In one special instance the farmer estimated his loss at 40,000 bundles. Most of the winter crops, such as wheat and oats, have been eaten down once at least, but, owing to the plentiful supply of water, not much damage will result.

Potchefstroom.

April.—Phenomenal rains have fallen during the month. The days have been temperate and the nights cool. Rain at Potchefstroom registered 5.12, and at Klerksdorp 5.84 inches. Ploughing is still being vigorously pursued, preparing virgin soil and dry lands for the next season. Locusts are still in evidence in some parts of the district, but farmers are expecting to reap moderate crops in spite of these insects. All live stock are in good condition. The veld in some parts of the district is good, but where the locusts have settled it is very poor. The water supply is plentiful and the prospect for the winter is good.

May.—About ¾ of an inch of rain was registered during the month. Towards the early part the weather was temperate ; during the latter portion, however, severe cold weather set in with cold southerly winds and frost at nights ; 12 degrees were registered on one occasion. Farmers are still busy putting in their winter crops. Fruits and vegetables are somewhat scarce. The following are some current market prices : Forage, per 100 bundles, 15s. to 33s. ; Kaffir corn, 7s. 6d. to 11s. per 200 lbs. ; mealies, per 200 lbs., 10s. to 13s.

June.—No rain fell during the month. The weather during the day was comparatively mild, and the nights cold. The winter crops are beginning to show, but cold weather is anticipated later which will probably cause damage. Several farmers have trekked with their stock to the bush-veld. White labour is plentiful at 5s. per diem, and native labour fair at 2s. to 2s. 6d. per diem.

STANDERTON.

April.—Rain has fallen at intervals during the month, with plenty of mists in the morning. The days have been warm. The weather has been generally very mild for the period of the year. The harvesting is proceeding apace, but in some parts of the district has had a check owing to rains and locusts. The crops this season are considered good, although some fine fields of potatoes have suffered from too much rain and have rotted. Farmers generally are pleased with the results. The following are some current market prices: Manna, 8s. to 10s. per 100 bundles; oat-hay, 10s. to 12s. per 100 bundles; mealies, 10s. to 12s. 6d. per 200 lbs. sack; potatoes, 10s. per bag of 200 lbs. (best only); potatoes (inferior), 7s. per bag of 200 lbs. There is a liberal supply of water for the winter, and the veld is still in fairly good condition. Lots of farmers are providing themselves with winter feed for their stock, and there is not such an exodus to the winter veld as in the past years. The native labour supply seems fair at wages varying from 30s. to 40s., with food.

May.—Few showers of rain fell during the early part of the month; hard and severe frosts at the end of the month, with cutting winds. Forage has all been reaped and stacked. Farmers are now busy shelling their mealie crop. The yield is good, and, in most cases, is quite up to expectations. The live stock are in good condition, and, as most of the farmers have made some provision for winter feed this year, their condition should continue good. There is an abundance of water for stock on the farms. There is a good amount of native labour offering on payment, but, except for harvesting, the farmers do not require additional labour on the payment system.

June.—No rain fell during this month; occasional heavy frosts occurred, but the weather generally was very mild. Most of the farmers have finished harvesting their mealies and are now shelling. The mealie crop has proved very successful this season, averaging about 5 to 6 bags per acre. Vegetables are scarce.

VOLKSRUST.

April.—A good number of south-east winds were experienced, bringing thick mists. No frosts were recorded, and, on the average, the weather was much warmer than the corresponding month last year. 3.83 inches of rain fell on 17 days; average considerably more than last year. Maximum temperature, 76.4, on 1st; minimum temperature, 33.3, on 23rd. This season's crops are not yet to hand except potatoes. Local prices are about the same as last month. Live stock generally are in good condition, sheep especially so. Grazing is becoming poor, but the water supply is ample.

May.—Very cold frosts occurred at end of month, with bitter north-west winds. Average amount of sunshine, but, owing to cold winds, is not effective in keeping warmth in day-time. 0.36 inches

of rain fell on 5 days. Maximum temperature, 70.0, on 1st, 2nd, 21st and 27th; minimum temperature, 19.0, on 29th. Farmers are now busy ploughing and gathering in crops. Last year's crops are now on the market. As this district had not been affected by locusts, the supply of both mealies and forage are plentiful in consequence.

April.—No rain fell during this month. Prevailing wind from north-west, gentle in the morning but gaining force during the day. Frost was experienced on 24 days. Trees have been badly nipped by the frost. Maximum temperature, 68.3, on 30th; minimum temperature, 21.0, on 4th and 24th. There is a plentiful supply of mealies and forage of last season's crops offered on the market. Things generally are about the same as last year. Native labour is scarce.

Wakkerstroom.

April.—The weather has been showery during the whole month, with few hailstorms which, in some places, did some damage. Mealies are being harvested, and Kaffir corn and oats sown. Land is being broken up. The price of mealies is firm; forage very low but hardening towards the end of the month. Cattle and horses are looking well. Sheep are slowly improving.

May.—The weather has been mild till early this month, when we experienced the first very severe frost, and after that severe frosts almost every night. One shower of rain fell. The harvesting of mealies took up the greater part of the month. Some winter oats have been sown. Mealie stalks have been harvested for winter fodder, also hay towards the beginning of the month. Mealies ranged up to 11s. early this month, dropping in price towards the end. More swede turnips have been grown to be consumed on the land by sheep. Live stock are very fair on the whole, though the sheep are not in the same good condition as this time last year owing to the cold wet summer. The ewes due to lamb in May have required attention, the crop of lambs being very satisfactory on the whole. A large number of very fair sheep have been imported from Cape Colony and Natal into the district. In several cases more shedding accommodation for sheep has been made this year. White labour is plentiful, but native labour is somewhat scarce.

June.—The weather has been very seasonable throughout the month, with warm days and frosty nights. Strong westerly winds prevailed during early part of the month. The pruning of peach trees has been carried on, holes dug and other preparations made for the planting of fruit trees. Mealies on the middle veld are not specially good, but still more than sufficient for local consumption; price, about 7s. per bag; forage, 6s. per 100 lbs. Cattle, horses and sheep are looking fairly well. Veld feed is getting scarce owing to persistent and heavy frosts nightly, and the winds in the early part of the month. Water is plentiful.

USEFUL FACTS AND FIGURES FOR FARMERS.

THE CAPACITY OF A WELL.

The capacity of a well should always, if possible, be much greater than the probable demands which will be put upon it, and it should not be possible in a few hours to pump it dry with an ordinary pump. In working the ordinary domestic pump about 20 strokes are made per minute, and these will fill a pail with 20 to 24 pounds ; this is at the rate of about a cubic foot or 7.5 gallons in 3 minutes, and a good well should be able to supply water at this rate for several hours without failing.

The domestic animals on a farm will need water at the rate of more rather than less than a cubic foot per each 1,000 lbs. of weight per day. A cow giving a heavy flow of milk often takes nearly 2 cubic feet of water in 24 hours. Five cows, during 120 days in winter, averaged 85.4 lbs. per head when the water was warm, and 77.3 lbs. when it was cold. At this rate the equivalent of 40 adult cows would need 3,416 lbs. of water, or 54.7 cubic feet, and this would require, at the rate assumed above for pumping, 2 hours and 45 minutes to supply them.—"Physics of Agriculture," King.

TEMPERATURE.

The temperature of animals is taken by means of a self-registering, clinical (fever) thermometer, inserted into one of the natural openings of the body, usually the anus or the vulva. The thermometer should always be shaken down before using, and allowed to remain in the body at least three minutes. The temperature of animals in a state of health ranges as follows :—

Horse	100 to 101	degrees	Fahrenheit.
Cow	100 to 103	,,	,,
Sheep	101 to 103	,,	,,
Dog	101 to 102	,,	,,
Pig	102 to 104	,,	,,
Fowls	107 to 108	,,	,,

A rise in temperature, commonly called fever, denotes inflammation and a rapid oxidation of the tissues of the body. A rise in temperature of six degrees or more is likely to be dangerous, unless it is caused by some local condition that is soon removed. In disease a rise of four degrees is serious. A sudden fall of temperature below normal, unless due to some local cause, is always serious, and usually denotes waning vitality and the approach of death. A person who takes care of much stock should equip himself with a good clinical thermometer and familiarise himself with its use. He will find it a valuable aid in recognising disease.—"The Care of Animals," Mayo.

ENSILAGE FEEDING TABLE.

Table giving the inside diameter of silos 24 feet and 30 feet deep which will permit the surface to be lowered in feeding at the mean rate of 1·2 to 2 inches per day, assuming 40 lbs. of silage to be fed to each cow.

No. of Cows.	Feed for 240 Days.						Feed for 180 Days.					
	Silo 24 feet deep. Rate 1·2 in. daily.			Silo 30 feet deep. Rate 1·5 in. daily.			Silo 24 feet deep. Rate 1·6 in. daily.			Silo 30 feet deep. Rate 2 in. daily.		
	Tons.	Inside diameter.		Tons.	Inside diameter.		Tons.	Inside diameter.		Tons.	Inside diameter.	
		ft.	in.		ft.	in.		ft.	in.		ft.	in.
10	48	11	11	48	10	2	36	10	4	36	8	9
15	72	14	7	72	12	5	34	12	8	54	10	9
20	96	16	10	96	14	4	72	14	7	72	12	5
25	120	18	10	120	16	0	90	16	4	90	13	10
30	144	20	8	144	17	6	108	17	10	108	15	2
35	168	22	4	168	18	11	126	19	4	126	16	4
40	192	23	10	192	20	3	144	20	8	144	17	6
45	216	25	7	216	21	5	162	21	11	162	18	7
50	240	26	8	240	22	7	180	23	1	180	19	7
60	288	29	2	288	24	9	216	25	3	216	21	5
70	336	31	6	336	26	9	252	27	4	252	23	2
80	384	33	8	384	28	7	288	29	2	288	24	9
90	432	35	9	432	30	4	324	30	11	324	26	3
100	480	37	8	480	31	11	360	32	8	360	27	8

—" Physics of Agriculture," King.

TO PRODUCE GOOD CREAM.

The following suggestions for the production of cream of good quality are given by the Oklahoma Experiment Station :—

1. Clean cream, cold cream, and rich cream are the three words which tell the secret of producing sweet cream.
2. Be clean and sanitary in milking.
3. Have all pails, crocks, cans and dairy utensils scalded and clean.
4. Keep the separator clean by washing thoroughly after each separation.

5. Cool each lot of cream in cold water before setting it away, and have it thoroughly cool before adding to the general lot of cream. (A good way is never to mix a fresh batch of cream with older cream, but keep each lot from the different separations separate and in one gallon crocks.)

6. Have a well ventilated cave or good cellar in which to keep the cream.

7. Stir each of the separate lots of cream every day to keep them uniform.

8. Have a wire screen for each crock so as to "air the cream" and keep out flies and insects.

9. Skim a rich cream—35 to 45 per cent.—and it will keep sweet longer.

10. Deliver the cream to the creamery or receiving station three times a week in summer, and twice a week in winter.

11. Insist on the creamery man weighing out the sample of cream for a test instead of measuring in pipette. The scales are more accurate.

12. Make a study of the herd, select the best cows, sell the poor ones, buy or raise more good ones, and make the cows keep you instead of your keeping the cows.

A SHORTHORN MILKING RECORD.

What is claimed to be the champion Shorthorn cow of the world is in the herd at the Nebraska Experimental Station. She is named Florence Airdrie VI., and, according to a report by Professor A. L. Haecker, she gave, in the year ending April 7 last, 10,187 lbs. of milk, containing 413.01 lbs. of butter-fat, out of which 481.84 lbs. of butter were made. Her milk and butter records for the past three years are as follows :—

Year.	Milk. lb.	Butter-fat. lb.	Butter. lb.
1903-4	7,537.5	358.51	418.26
1904-5	7,112.5	316.03	368.70
1905-6	10,187.0	413.01	481.84
Three years ..	25,137.0	1,087.55	1,268.80
Average (3 years)	8,379.0	363.51	422.93

Professor Haecker says that he has searched all the records of Shorthorn cows that he has been able to find, but cannot find any that equal the performance of this cow in 1905-6.—"The North-West Farmer."

REMEDIES FOR SICK ANIMALS.

The following are some useful remedies for sick animals, taken from "The Care of Animals," by Nelson S. Mayo :—

Alcohol, Whisky, Brandy.—Doses from 1 dram to 4 ounces, depending on size and age. Should be largely diluted with water. Good for chills, depression and collapse, or when the animal is very weak.

Alum.—Horses, 1 dram ; cattle, 3 drams ; sheep, ½ dram ; pigs, ¼ dram. Used for diarrhœa. In solution, used for sore mouth.

Boric Acid.—Non-poisonous antiseptic. Used for sore mouth, sore eyes, roup and to inject into udder. Used in solution, 20 grains to 1 ounce of water.

Calomel.—Horses, ½ to 1 dram ; cattle, 1 to 2 drams ; sheep and pigs, 5 to 20 grains. General purgative, and used to expel worms. Externally, dusted in old sores to dry up and heal them.

Carbolic Acid.—Used as antiseptic to hasten healing of wounds and sores ; also as disinfectant. Dissolve 1 part of acid in 30 parts of water. Poisonous.

Castor Oil.—Horses, 1 to 2 pints ; sheep, 4 ounces ; pigs, 2 ounces ; calves, 2 to 4 ounces. An excellent purgative. Small doses, combined with laudanum, excellent for scours.

Epsom Salts.—Purgative for cattle and sheep. Cattle take 1 to 1½ pounds ; sheep, 2 to 4 ounces, dissolved in warm water.

Paraffine.—Internally, good for stomach worms. Give lambs 1 to 2 drams in sweet oil. Externally, is mildly irritant. Rub it in well.

Lard.—Used fresh to rub on irritated skin, softens and soothes. Internally, given as a purgative to small animals. Melt and give from 1 to 8 ounces, according to size.

Lime Water.—Made by slaking fresh lime, allowing it to settle and using the clear water. Useful in diarrhœa of young animals. Dilute their milk one-third with lime water. Finely pulverized air-slaked lime is good to dry up sores by being dusted on.

Quinine.—Horses, ½ to 1 dram ; cattle, 2 to 4 drams ; sheep, ½ dram ; pigs, 10 grains ; dogs, 1 to 5 grains reduces fever. Stimulates, and in small doses is bitter tonic.

Salt, Common.—Useful as food in small quantities. Solution of 1 ounce salt to 1 pint water is good for sores and wounds. Give all animals a little salt in food.

Sulphur.—Cattle and horses, ½ ounce ; sheep, 1 dram ; pigs, 20 grains. Dusted in hair, useful against lice and mites. Not often used internally. Ointment, 1 part sulphur to 6 parts lard, good for lice. Sulphur is often burned in closed empty room to disinfect. Set vessel containing burning sulphur in a larger vessel filled with water to prevent danger from fire.

Turpentine.—Horses, $\frac{1}{2}$ to 2 ounces ; cattle, 2 to 3 ounces ; sheep, 1 to 3 drams ; pigs, 1 dram ; dogs, 5 to 30 drops. Give in oil, gruel or milk. Good for colic, bloating and intestinal worms. Stimulates the kidneys. Externally it is an irritant. Used in liniments.

THIN SEEDING IN DRY LAND FARMING.

Under ordinary conditions in a humid region or with irrigation, farmers sow about 5 pecks of wheat or 75 pounds per acre, and from 15 to 20 pounds of lucerne seed per acre. On the dry lands of the Great Basin*, experience has shown that much better crops of wheat result when only 3 pecks of wheat or 45 pounds per acre are sown, while with lucerne about 8 pounds of seed per acre gives the best results. Some farmers even sow 35 pounds of wheat per acre without apparently decreasing the yield, and careful experiments have shown that even less than 8 lbs. of lucerne seed per acre will give a good crop if evenly distributed, but uniform distribution is difficult with much less than 8 pounds of seed per acre. The beneficial effects of thin seeding are very striking, particularly in the drier years, when a seeding of 75 pounds of wheat results in crop failure ; while a seeding of 35 pounds gives a good crop. This apparent anomaly is due to the fact that the heavier seeding results in so large and sudden a demand for soil moisture that the supply within reach is exhausted while the plants are still in the active growing condition and before the seed is formed, while with thin seeding the same amount of soil moisture is sufficient for the plants produced. Both wheat and lucerne are able to throw out numerous branches from the central stem, so that when moisture conditions are favourable the number of stems actually seeding.—"Bulletin No. 103, U.S. Department of Agriculture—Bureau of Plant Industry."

ROUP.

Roup is a contagious inflammation of the mucous membranes of the head of fowls, associated with a catarrhal discharge from the nostrils and eyes. It is a common disease, especially when poultry are kept in damp and unsanitary quarters. It is due to a germ which may be introduced by means of diseased fowls, or by infected coops or pens. Good care and food enable birds to resist invasion by the germs. Any conditions that tend to lessen the vitality of the bird favour the development of the disease.

At first, the discharge is thin and watery ; but later it becomes thick and yellow, collecting about the nostrils and in the eyes and throat. The fowl is often unable to see, owing to the inflammation,

* A large body of land lying in the States of Utah, Nevada, Oregon and California.—[EDITOR, *T.A.J.*]

swelling and collecting of matter about the eyes. As the disease progresses, the comb and wattles become abnormally red, and the clogging of the nostrils and throat makes breathing difficult. Throughout its sickness the bird is dull and weak, with plumage rough and erect. Finally the fowl becomes unconscious, and then soon dies.

In most cases the best treatment is to kill and burn the bird as soon as the disease appears. Antiseptics used about the head will usually overcome the disease. Creolin, one part to one hundred parts of water, is excellent ; also boric acid, twenty grains to one ounce of water ; also paraffine oil. In all cases, the mucus should be washed away, the parts well cleaned, and the remedy thoroughly applied. In the spring or autumn it frequently happens that a number of birds are noticed sneezing and snuffing from colds, with a slight discharge of mucus from the nostrils. For these "colds," and as a preventive of roup, one teaspoonful of pure carbolic acid to one gallon of drinking water is excellent.—"The Care of Animals," Mayo.

THE WHEAT CROP OF THE WORLD.

America leads the world in the production of wheat. The 1906 world-crops, according to the official figures, were as follows :—

	Bushels.
United States	735,261,790
Russia	450,000,000
France	324,725,000
India	319,586,000
Austria-Hungary	268,574,000
Italy	168,000,000
Spain	154,090,000
Germany	144,754,000
Argentina	134,931,000
Canada	131,614,000
Roumania	113,867,000
Australia	68,520,772
United Kingdom	60,522,000
Cape Colony	1,701,800

The crops of other countries bring the total up to the enormous figure of 3,423,704,000 bushels, so that the production of the United States is nearly 20 per cent. of the world's output.—"Scientific American."

DIARY FOR FARM, GARDEN AND ORCHARD.

NOTES ON THE FARM.

By Alex Holm
(General Manager, Experimental Farm, Potchefstroom).

November.

Crops.—On most farms this is the most important month for the seeding of crops. Kaffir corn may be sown early in the month, and the sowing of maize should be completed with, perhaps, the exception of early varieties, or that to be grown for ensilage. The most desirable width for the rows is about 3 feet ; the crop can then be cultivated with horse hoes, and sufficient air space for the growth of the plants is provided. The tall growing varieties might, perhaps, benefit by being in rows 3 ft. 6 in. apart, while the early varieties (generally less robust in growth) might be grown at 2 ft. 6 in. On very dirty land check rows are an advantage ; the grains are then dropped in hills, generally at 3 ft. apart. The amount of seed required per acre varies according to size of grain. With rows at 3 feet apart, 12 lbs. of large grain, 10 lbs. of medium-sized grain and 8 lbs. of small grain is sufficient. Efforts must be made to increase the yield of mealies in this country without greatly adding to the working costs, and thereby the cost of production will be decreased. This can be brought about by growing the best varieties, and by improved methods of cultivation. The Department of Agriculture has introduced into this Colony varieties which are suitable for its varying climatic conditions.

The advisability of manuring the maize crop has yet to be fully demonstrated. Undoubtedly heavier yields can be obtained by judicious manuring, but careful experiments will require to be made over a period of years to ascertain whether the results are economically sound. Farmyard manure is only obtainable in limited quantities, and a great deal of labour is involved in its application, while artificial manures are expensive, when the shipping and railway charges are added to the cost.

Our present experience indicates that on ordinary soils it will only pay to apply phosphatic manures to the mealie crop. An application of 200 lbs. finely ground bone meal, and 100 to 150 lbs. superphosphate (according to quality) per acre is likely to give the best results.

"Old lands," which are deteriorating, will be improved in fertility by "green" manuring. A trial of different crops for this purpose indicated that white lupines are likely to prove the best. Half fallow the land until early in January, then sow these at the rate of about 80 lbs. per acre, and plough them in during the following winter.

DECEMBER.

Stock.—Heat, flies, and ticks will now begin to be troublesome. More shelter for stock is required over a great part of this Colony. Clumps of trees should be planted in different parts of the grazing land, and belts of wattles should be sown in localities where they will grow, to break the winds and give shelter from storms. If no natural shelter is available and there is plenty of stone in the district, useful shelters can be provided by simply erecting walls of stone ; a roof, though useful, is not always necessary, as the animals will obtain a great deal of shelter from the wall itself.

The practice of "kraaling" stock at night and herding them during the day is not attended with the best results. Stock of all kinds, and especially sheep, thrive much better if allowed to find their own resting place and are not disturbed in their grazing during the day time. In order to do away with "kraaling," fencing must, however, be done, and this entails expenditure, but the expense will be sound economy, even if interest has to be paid on a loan to carry it out.

Crops.—The remainder of the maize crop should be sown as early as possible. Some early varieties can safely be sown in most districts till Christmas, but the yield of early varieties is seldom so high as that of late ones. Maize may also be sown this month for ensilage purposes. See article on Ensilage in the July, 1906, number of the "Agricultural Journal."

Root crops may be sown this month in districts where fairly frequent rains fall to carry the young plants beyond the critical stage. Mangold-wurzel is perhaps the best root crop to sow. Swedes and turnips are not to be recommended for the Western Transvaal, but it is reported that they do well in the Eastern district. Mangel growing should receive more attention, especially by stock breeders. They are most valuable in the winter season for ewes in lamb or ewes rearing lambs, and for young stock.

Weeds will be troublesome this month, and to be successful in keeping the land clean they should be dealt with as soon as possible after they have germinated. In their seedling stage a light harrow will destroy the greater part of them. Nearly all crops can be harrowed with safety, and a stirring of the surface soil does them good.

JANUARY.

Stock.—Grass should be plentiful, and all kinds of stock should be in a thriving condition. A daily examination of the herd and flock should, however, be made, so that any animal which exhibits any symptoms of sickness or unthriftiness can be promptly treated. Losses among stock are thus largely prevented by good management. Cows, being now in an improving condition, will take the bull freely. On ordinary stock farms, where winter milk is not desired, this is

probably the best month for service to take place. The period of gestation of the cow being about nine calendar months and one week, the calves would be dropped in October. Careful observation should be made to ascertain whether the bull is proving to be a good stock getter. A proportion of the cows served generally return for service at 20 or 21 days after the previous service, but if this proportion exceeds 20 per cent. after the second service, another bull should be used on these cows if one is available. A full grown bull can be used to 60 cows during the course of a year, and may be allowed to run with about 40 cows during a service season spread over two or three months.

In large herds greater success will attend the practice of separating the bulls, and of placing with each a certain number of cows, than if the several bulls are allowed to run together with the whole herd. When the bulls have been with the cows for about six weeks, they should be interchanged from one lot to another. If all the bulls be allowed to run together, the "master" one will maintain sway to his own detriment, and to the detriment of the proportion of the cows found to be "in calf." In this connection, let me urge upon stock breeders the discontinuance of two practices which are so detrimental to the improvement of stock, and the successful rearing of stock in this Colony :—

Firstly, the use of mongrel bred bulls—animals which possess no quality except that of hardiness, and which beget offspring which are neither uniform in type nor do they possess any of the qualities of beef or milk production in any marked degree. Without disparaging the importance of a good dam, the influence of the sire, regardless of any question of prepotency, is fifty times as great, since his qualities are transmitted to 50 or more of his offspring in one season, whereas the character of the dam is only handed down in one animal. By the continual use of well-bred sires, inferior stock in other countries have been graded up to a high standard of merit, and with knowledge and enterprise the same result should even more rapidly be secured in this Colony, which possesses excellent foundation stock in its indigenous breed.

Secondly, the common practice of allowing cattle, young and old, to be reared together is one which has no defence in any herd where an attempt at sound and successful management is made. The absence of sufficient fencing, and the difficulties of watering stock on many farms, is to a large extent responsible for this practice in this Colony, but if stockbreeding is to become a source of profit to the owner, an effort should be made to overcome the difficulties. The castration of young bulls at an earlier age, and the grazing of the heifers apart from all bulls until they are at least two years old, will do much to remove this obstacle to successful stockbreeding.

Blue-tongue in sheep generally begins at this season of the year. There is every prospect that it will be successfully combated by inoculation with Dr. Theiler's blue-tongue vaccine.

Trees.—This is a good season for planting trees. Varieties should be chosen suitable for the purpose required, and suitable to the climatic conditions in the district in which they are planted. They can be obtained at cheap rates from the nurseries of the Division of Forestry, particulars of which have been issued in catalogue form by the Department, and can be obtained, free of charge, on application to the Government Printer, Pretoria.

NOTES ON THE GARDEN.

NOVEMBER.

Vegetables.—Sow asparagus, artichoke, beans, cabbage, beet, cauliflower, carrots, chicory, cucumber, mealies, egg plant, endive, leek, lettuce, parsnip, melons, onions, rhubarb, salsify, scorzonera, radish, spinach, tomato, turnips, squash, pumpkins, and all kinds of herbs.

Water Melons.—Water melons can still be sown this month. They thrive best in a moderately enriched light soil. The hills should be from 4 to 6 feet apart each way, according to the richness of the soil. Before planting mix well with the soil in each hill about two shovelsful of well rotted manure. Sow from 12 to 15 seeds to each hill, and thin out when the plants are large enough, leaving three or four of the strongest. Pick off the leading shoots as the growth becomes too luxuriant. The same applies to sweet melons.

Flowers.—In this month the following flower seeds may be sown :—Mignonette, candytuft, stocks, pinks, daisy, phlox, verbena, aster, carnation, cosmos, zinnia, cockscomb, petunia, sweet pea, dahlia, tuberose, narcissus, snowdrops, violets, freesia, lily, etc.

DECEMBER.

Vegetables.—Sow borecole, broccoli, Brussels sprouts, beans, cabbage, cauliflower, carrot, cress, celery, kohl rabi, lettuce, mustard, peas, radish, spinach, parsnips, parsley, tomato, vegetable marrow, and all herbs. Potatoes can now be planted.

Flowers.—Sow cosmos, balsam, stock, larkspur, marigold, petunia, candytuft, phlox, carnation, sweet pea, pinks, snapdragon, and aster.

In sowing flower seeds it is well to select a shaded place, but not under the drip of trees. If there is no natural shade some covering should be placed over the seed bed, a foot or two above it, during the hottest part of the day. The soil should be made as fine as possible, and the seed covered to its own depth only. Very small seeds, such as begonia, mimulus, etc., are best sown in pots, watering the soil well before sowing the seed. The seed should be spread evenly over the surface, and not covered with soil, and a piece of glass should be fitted closely to the top of the pot to check evaporation, and then no water will be required until the young plants have appeared.

JANUARY.

Vegetables.—Sow beans (bush and runner), beet, borecole, Brussels sprouts, cabbage, cauliflower, carrots, mustard and cress, cucumber, lettuce, parsnips, radish, spinach, tomato, turnips, and all herbs.

Plant out from seed-beds cabbage, cauliflower and celery (in trenches). Stop cucumber vines when setting fruit by pinching off the points of the shoots. Plant out potatoes. Protect the seed-beds from the sun, it being too strong for tender seedlings. Keep up a good supply of water, and see that the ground does not become caked.

Flowers.—Sow primula, cineraria, carnation, stock, foxglove, columbine, wallflower, daisy, godetia, dianthus, verbena, snapdragon, sweet pea, and other hardy flowers.

THE ORCHARD.

By R. A. DAVIS, Horticulturist.

NOVEMBER.

Deciduous Fruit Trees.—The stems of young fruit trees which were planted last season may be whitewashed, to prevent sun burn. This is the only case in which whitewashing is of the slightest use to the trunk of a fruit tree. Many people like to see the stems of their fruit trees looking white and clean. There is no real reason why this should not be done if anyone wishes it. The only remark I wish to make is that though it will not do any good to the trees, it will certainly do no harm.

This is the month for early fruits to make their appearance. Apricots and peaches of good quality are now obtainable during this month, and if last year is any criterion prices should be fairly high. Picking, packing, marketing in a neat small attractive package have all to do with the securing of good prices. I am glad to say there is no difficulty now in obtaining boxes for packing in the Transvaal. Messrs. Mosenthal Bros., of Church Street, stock clear pine boxes in the following sizes :—

2 x 9 x 15, apricot and plum ;
2½ x 12 x 18, plum and peach ;
5 x 12 x 18, pear ;
The California half-crate, containing 4 baskets, each holding 5 of fruit ;
The California standard orange box ;
The California standard apple box, 22 x 11 x 10 ;

while Messrs. Francis & Sons, of Market Street, Pretoria, are making arrangements to secure locally made boxes.

Citrus.—Prices for all kinds of citrus fruits are now advancing, and the demand for late ripening varieties is becoming very large. The

Valencia-late and Du Roi are two of the best late varieties. In those cases where all the fruit has been gathered in and there is a nice young crop coming on, it is time the trees should have a thorough soaking of water. If good rain has not already fallen, resort must be had to the irrigation furrow ; in those cases, however, where growers are trying to hold the fruit on their trees for the late market, water should not be given in anything like such large quantities.

DECEMBER.

Deciduous.—On looking over last year's Orchard Notes I find they are so suitable to the present conditions that at the risk of repetition I am publishing them again in identically the same form. After last month's remarks about the picking and packing of fruit, one would think not much further need be said on the subject. It has been found, however, that this is a matter which has constantly to be kept before the public, which is rather remarkable when one considers that the packers of good fruit reap such a good harvest. An ideal should be aimed at in every industry. The point to be attained in fruit packing is "when your boxes of fruit sell on sight of the packer's name or brand, without any examination or opening." This cannot be achieved without personal supervision and watchful care over every operation from the picking of the fruit to the sale of same on the morning market. Much is needed, and will undoubtedly be supplied, by our railroad system as the need developes. Special refrigerator fruit cars will be a necessity, and each will have to be packed properly—a space for each box, not as at present ; and, in addition, the rates on fruit will probably need revising, and the time in transit accelerating. Each package of fruit should bear the grower's name (brand if he has adopted one) and address, with the variety of fruit distinctly set forth, also the number of specimens contained in each box. Bear in mind, also, that once having built up such a reputation that your fruit sells on sight of your brand alone, if you should attempt to trade on that reputation you are on the high road to low prices. This means constant care to pack sound fruit, to send out only the best. A lost reputation is difficult to rebuild. Wherever possible grow your peaches, apricots, plums, etc., without irrigation. Too much water is usually given, and that is worse than none at all ; it renders fruit large, but spoils texture, flavour and carrying qualities. It must, however, be borne in mind that if no water is given, frequent cultivation of the ground is imperative. Fruit which is produced under what is known here as dry cultivation is undoubtedly of the best quality ; this being due to the fact that the trees receive enough but not too much moisture. Whilst this system of cultivation is carried out on all the experimental stations of this Department, the use of irrigation is far from being entirely condemned. Some parts of the Colony are frequently in sore need of water, and suffer from hot dry winds, which make evaporation

extremely rapid. The judicious use of water in such cases is to be advocated; always make the work as thorough as possible and follow up with cultivation.

Summer pruning, in those instances where it is necessary, shall now be undertaken. Instructions with reference to this operation may be obtained by applying for a leaflet on this subject, which has been issued by the Department.

Citrus.—This is one of the best summer months for planting oranges, lemons, etc., and is exactly in opposition to the laws which govern the planting of deciduous fruit trees. These should only be planted when dormant, during the months of July and August. Citrus, however, and in fact all ever-green trees may be very safely transplanted during the summer months in this Colony. As a rule, this is an off month as regards work in the orange grove, but there are always many things that require looking after. An ever watchful eye should be kept on the look out for the first sign of collar rot. The trees should be carefully examined for scale and other insects, all dead wood should be cut out and the lower limbs of the tree so trimmed up with the pruning knife that their ends may be at least eighteen inches from the ground. It is pleasant to note that this system of training is gradually becoming more widely spread, and it is hoped that eventually it will be generally adopted throughout the whole Colony.

JANUARY.

Deciduous.—As is generally known, there has been no jam factory in operation in the Transvaal since the war. The time has arrived, however, when a certain surplus of fruit may be possible, and it is to be hoped that arrangements will be satisfactorily made which will admit of the manufacture of jam being begun in this Colony, as is the case in Natal and Cape Colony. This is the month of the year for Transvaal fruit generally, and peaches and plums in particular. It is rumoured that owing to the low prices obtained on our markets last year by the Cape Colony shippers we are not to be favoured during the present season with quite as many consignments of their fruit. This should leave our market in a better condition for our own growers, of whom there are a number at present who will enter the field this year on a fairly large scale, and whose fruit will have the additional advantage of being placed on the market in a perfectly fresh condition. There are no particular cultural hints for circulation this month, but I would like to point out that we have an Entomologist in the Agricultural Department who will be only too ready to offer any assistance to anyone who is in trouble with insect pests.

Citrus.—This is also a good month for planting young citrus trees of all kinds. A much needed word of caution is given here with regard to two points which were noticed last season. Do not, in the first place, purchase any citrus trees, mango, etc., for shipment, loose, or with roots packed in moss; such trees should always be packed in

soil. The freight may cost a little more, but with trees packed in this manner the chances of losing even one tree in transplanting are reduced to a minimum. A further caution is needed with regard to the trees themselves. As often as not citrus trees are sent in from our neighbouring Colonies which are utter rubbish, often measuring not over 15 inches in height and composed entirely of first growth wood—in reality sap wood. These are accepted and planted in good faith, but with a couple of degrees of frost in the winter there is an end of them. This means loss all round, excepting to the railroad. The purchaser loses his trees and the transport costs, while the nurseryman loses his good name, and possibly is compelled to replace the trees in order to keep on good terms with his customer. So no one is benefited, and yet a good many people *will buy* small trees because they are low priced (but not cheap), and the nurseryman will supply small stuff because they can do it at £2 or £3 per 100 less than a well grown tree would cost. Now a fair price for first-class well grown citrus trees, ¾ of an inch in diameter at a foot from the ground, and not less than four feet in height, is 4s. each, packed in single tins and buying by the 100. The trees should be grown to a single stem and staked to keep them straight. This system is rarely practised, the usual tree one gets having already branched out in tree form in the nursery. Still, if you cannot get the kind of trees here described, insist, at any rate, upon getting the very best you can, and accept nothing under 3 ft. in height; look out for a good solid stem of well matured wood, and "see that you get it." A fair price for such trees as are usually described as first-class and answer the latter description, would be £15 per 100. One item further may be mentioned, and that is, you may buy now any kind of fruit tree grown in South Africa without any risk of getting any disease with it. The Ordinance for preventing the spread of insect pests and plant diseases now in force, and administered by the Entomological Division, is one of the greatest safe-guards against diseased trees.

CORRESPONDENCE.

This column will be devoted to correspondence, and an endeavour made to reply to all inquiries upon agricultural topics, or concerning any of the articles published from time to time in the *Journal*.

Correspondents will kindly write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the "Agricultural Journal," Department of Agriculture, Pretoria.

UTILITY OF HOMERS IN THE COUNTRY DISTRICTS.

To the Editor of the Agricultural Journal.

Sir,—Will you kindly allow me a little space to set before our farmer friends the benefits of keeping homer pigeons? A subject continually cropping up at Farmers' Congresses is the means of attaining better communication in the country districts. Now, homing pigeons have been referred to on these occasions, but in such terms as to indicate that the real practical utility of these birds is not fully realized.

If the farmer once understood and believed that the breeding of homers is a comparatively easy matter, and that their return to their lofts, when properly trained, is practically certain, he would surely grasp what a useful and cheap means of communication lies within his reach. Take the case of a farmer at a considerable distance from home. What is easier than for him to take half-a-dozen birds in a basket to the town or railway station for which he is bound and despatch them as need may arise?

Or, again, an overseer is left in charge of a farm and wishes to report at intervals to his employers. The latter takes over a basket of birds which can be released at regular periods with the required messages, or a loft can be kept at both ends, and birds exchanged, thus establishing a regular post. The same would apply to friends living at a distance, and would undoubtedly add greatly to the interest of country life. The farmer's birds would cost him practically nothing to keep.

A most important development would be the establishing of lofts at the different magistracies throughout the country whence birds could be furnished to the mounted police on their rounds. There can be no doubt that circumstances must frequently occur when the benefit of such a rapid and certain means of communication would be simply invaluable.

When I say that it is an easy matter to breed and train homers, I am not thinking of the bird that competes in a 500-mile race against dozens of others, and wins perhaps with only a few minutes in hand. What I have in mind is the bird which is perhaps only moderate in

point of speed, but can be relied upon to turn up at its loft, and for such distances as would be required, say up to 100 miles, it would be quite easy to obtain such birds in the first season of breeding. Of course it goes without saying that good blooded birds are needed for a start, and fortunately there are plenty such to be had in the Cape Peninsula, and at very moderate prices. A good example of the practical use of homers was afforded by the saving of several lives from a wrecked dredger off the Natal coast some months ago. The rescue was due solely and entirely to the fact that the captain of the boat had several homers on board, and dispatched them with appeals for help.

. . . .

Now I do not claim any originality or credit for my suggestions, which probably have been put forward before, nor am I in any way interested in the breeding or sale of homers, but I do think the fact that our country friends have a remedy in their own hands, for their isolation should be brought home to them.

I do not wish to infringe upon your space with details as to breeding and training, which would naturally be of some length. Suffice it to say in brief that the breeding season usually commences early in May, and the training of young birds in November. It will be understood that the stock birds are not allowed freedom, as they would return to their lofts. An interesting case of the strong homing instinct common to well bred birds was recently shown by some of the stock birds belonging to Mr. A. J. Savage, late of Woodstock, near Capetown. After residing several months in Bloemfontein and breeding from the birds in question, Mr. Savage ventured to let them out for a little exercise, whereupon they at once made tracks for their old quarters, turning up there in almost record time.

I shall be happy to furnish the address of club secretaries to any enquirers, and I am sure these officials would be glad to reply to any questions regarding stock birds or in regard to breeding and training.

Yours, etc.,
F. LINCOLN LEAK.

Main Road, Observatory,
Capetown, C.C.

GALL SICKNESS IN SHEEP.

To the Principal Veterinary Surgeon.

Sir,—I am losing a lot of my sheep through gall sickness, and I have tried all sorts of the farmers' remedies about here, but they have failed. Can you not prescribe anything good for this. I should be indeed very much obliged if you can help me in any way in this matter, as I have lost a good many fat ewes.

Yours, etc.,
A. W. REED.

Balmoral, Middelburg.

Answer : With respect to your enquiry, there are so many disorders grouped together under the name of gall sickness that it is somewhat difficult for me to advise you as to treatment without obtaining some more definite information on the symptoms shown by the affected animals during life—the duration of the disease and the *post mortem* appearances after death. If you can give me some particulars on these points, I will then be better able to express an opinion as to the cause of the illness of your animals, and most appropriate treatment. If, however, the condition is due to the sheep feeding on dry unnutritious herbage, I would suggest that you try the administration of six or seven grains of calomel shaken dry on the back of the tongue, and followed in about six or eight hours' time by two or three ounces of Epsom Salts, to which a little ginger and sugar have been added, and the whole dissolved in about three-quarters of a pint of warm water. Should this not prove effective, please write me again, giving fuller particulars as to the character of the illness from which your animals are suffering.

C. E. GRAY,
Principal Veterinary Surgeon.

Sir,—I beg to thank you for your letter in reply to my enquiry regarding gall sickness in my sheep.

I am pleased to say that the prescription you sent me seems to act very well when the animal takes the sickness in the slow form. They seem to take this gall sickness in two different forms. The worse is as follows : The animal in full health suddenly ceases to feed, wanders away from the flock, has a staring look, and becomes excited, with a peculiar quivering of the eyes. When very bad it kneels down on its front legs and bites at the ground, apparently in much pain, and usually does not live longer than 2 to 6 or 8 hours at the longest.

The *post mortem* appearance is a general congestion and decomposition of the tissues, and swelling of the carcase takes place very rapidly. The gall is usually very large. The prescription you sent me does not seem to have effect before death.

Answer : With reference to your further enquiry regarding the prevention of gall sickness, I am rather inclined to think, from your description of the acute cases to which you refer, that these are cases of "geilziekte" rather than gall sickness. This is an affection apparently due to chemical changes occurring in the food after it is taken to the stomach. These changes are probably of a fermentative character, and in such cases taking preventive measures by dosing all your sheep is more likely to lead to good results than simply treating the animals when they show symptoms of sickness, as the disease runs such a rapid course that death ensues before the medicine has time to take effect. As a preventive, experiments have shown that Cooper's Dip is very useful. Mix one teaspoonful of Cooper's Dip with ten of

salt, and give each full grown animal a teaspoonful of the mixture twice a week for two or three weeks, and you will probably find that these cases no longer occur.

In the case of animals noticed to be ill you might try the effect of giving one tablespoonful of turpentine, shaken up in about six ounces of raw linseed oil, bleeding the animals at the same time, and removing about a teacupful of blood.

TULP POISONING.

Can you tell me what would be a good remedy to treat a sheep or goat when suffering from "tulp poisoning"?

Yours, etc.,

A. W. REED.

With reference to tulp poisoning in cattle, I would suggest that you administer about a bottleful of a mixture of equal parts of lime water and raw linseed oil. Should the animal show a tendency to blow up, as they often do in such cases, it would be well to tap the animal by introducing a trocar and canula into the first stomach by piercing the flank on the left side at a point equally distant from the last rib, flank angle of the haunch and the edge of the processes of the lumber vertebrae (that is just about the place where the hair curls on the flank of a horse). Trocar and canula—with instructions as to use—you can obtain from Messrs. Mayer and Meltzer, surgical instrument makers, Joubert Street, Johannesburg, and will cost probably about 5s.

C. E. GRAY,
Principal Veterinary Surgeon.

WIRE WORM IN DONKEYS.

To the Principal Veterinary Surgeon.

Sir,—In the July number of the "Dutch Agricultural Journal" I read of a remedy against wire worms in sheep and goats, made of Cooper's Dip, sulphur, lime and salt, and I would like to know whether this remedy is also a remedy for donkeys? I have two spans of donkeys suffering from an attack of wire worms.

Yours, etc.,

Lydenburg. A. HOPPE.

Answer : With respect to your enquiry as to dosing donkeys for wire worm with Cooper's Dip, salt and sulphur, you may do so, giving up to a teaspoonful and a half of the mixture prescribed for sheep ; but as the hair worm found in donkeys is different from that found in sheep and goats, I think you will find that better results will follow the administration of blue-stone. But if you give this do not give more than 40 grains of blue-stone dissolved in at least a whisky bottle full

of warm water. This dose should be repeated in about four days' time, but before dosing all your animals I would recommend you to try the effect of the dose mentioned on one or two of the weakest donkeys in your span, as animals which are much weakened by attacks of worms at this time of the year may not stand the administration of large doses well, and if your donkeys are much weakened it may be necessary for you to give a little less than the dose recommended.

C. E. GRAY,
Principal Veterinary Surgeon.

TOBACCO GROWING IN THE DISTRICT OF HEIDELBERG.

To the Tobacco Expert.

Sir,—I shall be glad if you will kindly give me a few hints in regard to tobacco growing in this district. The soil here is a red sandy loam. The tobacco is dried in the dwelling-house, under an iron roof, and by the open door, without any care. It burns very well, and is a large leafy kind of tobacco.

I want to grow and to prepare a first-class tobacco for cigar, cigarette (light colour) and tobacco (pipe), to see which is the best paying crop. At present I am building a large drying shed with stone walls and a grass roof. To the red sandy loam I have given a dressing of stable manure in January, and 500 lbs. per acre of basic slag and superphosphates mixed together in equal portions. I have reaped from this land an excellent crop of cattle turnips, and I propose to sow winter oats under irrigation, which I shall reap in November, and at the end of November I will plant tobacco without any more manuring. Do you think this is a good plan?

To plant about five English acres, how many square yards of seed beds shall I require? Could you let me have some cheese cloth for covering these seed beds? I might mention that the tobacco grown here is rather heavy, with plenty of leaf.

Yours, etc.,
C. BECKER.

P.O. Fortuna,
Dist. Heidelberg.

Answer: I have the honour to acknowledge your letter, together with the sample referred to therein. The leaves in question were not packed in good condition, and it is therefore a difficult matter to make an examination of them. In future, when submitting samples for inspection it would be well to pack the leaves in a slightly moist and pliable condition, rolled tightly and enclosed in a piece of cloth or linen so that the moisture does not evaporate.

2. From the description you give of your field I should say that the land will prove to be good tobacco soil. I think the heavy dressing of fertilisers you have applied is quite sufficient to insure a good crop

of tobacco. After the winter oats have been cleared off the land, the latter should be well prepared, so that it may be in a good condition when the time of transplanting arrives.

3. With regard to your enquiries as to the size of seed beds required for your plot, this, of course, all depends upon the quality of the seed sown, and whether it is sown thickly or not. In any case I should advise you to sow sufficient seed to allow of your having a few seed-beds of young plants in reserve. In this country the usual rate for sowing seed in the beds is one tablespoonful of seed (mixed with ashes or meal) for 100 square yards. It is necessary that the plants which die off in the field after transplanting should be replaced by others immediately if you are to obtain a crop of uniform plants. The strong, healthy plants should first be transplanted, the less forward ones being left until large enough. The distance at which the plants should be set out in the field varies very much having regard to the variety grown. Heavy tobaccos will only require about from 15 to 24 inches space between the plants ; but the same distance (*i.e.*, 3 feet) between the rows. The exact distance can only be determined if the special kind of seed to be used, etc., is stated.

4. I may say that I like the description of the curing shed you are building, and think it should prove a success, ventilators should be made in the shed of such a pattern that they can be controlled at will as it is necessary that any air moisture should be properly admitted and excluded.

5. I regret to say I am unable to let you have any cheese cloth at present, as we have only imported sufficient for our own experiments. If you are unable to obtain this material in the country, I would advise you to make grass or reed covers for your seed beds. These should be constructed in such a manner as to allow of their removal at will in order that the plants may receive sufficient light, and on the other hand are not scorched by the hot sun.

6. Referring to the seed question, I have no varieties on hand which I can recommend as a standard crop for your district. The object of our experimental work, amongst other things, is to raise good acclimatised seed on our Experiment Stations by selecting and breeding, etc. For the present the best advice I can give you is to obtain some seed from one of your neighbours, who has been growing tobacco with success. If the necessary care and attention is given to such seed the result should be gratifying. Although I cannot recommend any variety of seed as yet, I am sending you some samples purely for trial. These varieties should be kept quite separate in the seed beds and in the field, and I shall be glad to hear from you again as to what success you have with these. I am glad to find that you are taking such a keen interest in tobacco culture, and if I can be of any further service to you at any time, please let me know.

J. van LEENHOFF,
Government Tobacco Expert.

TOBACCO SEED GERMINATION.

Sir,—I duly received your letter with the seed enclosed, for which I thank you. What do you recommend for treating the seeds to make them germinate quickly, so as not to have them lying an unnecessarily long time in the seed beds and exposed to all sorts of risks?

Yours, etc.,
C. BECKER.

Answer : If the following points are observed the germination of tobacco seed will be greatly assisted :—

1. The seed beds must be well prepared, *i.e.*, the soil should be well pulverised, fertile and loose.
2. The seed bed should be kept dark until the seeds have germinated.
3. The beds must be covered at night time as a protection from the cold.
4. Keep the beds constantly moist (not wet) by applying water with a spray pump or *very fine* watering can.

J. van LEENHOFF,
Government Tobacco Expert.

TREATMENT OF TOBACCO.

To the Government Tobacco Expert.

Sir,—I am anxious, if possible, to sweat and cut my tobacco crop during the month of August. Of course the leaf is too dry to handle, and I would be glad of your advice as to the best method of (*a*) moistening the leaf so that it can be packed to sweat, and (*b*) whether it is better to sweat the leaf first and to cut it up afterwards, or to cut first and then sweat? My tobacco is a fine texture leaf ; reddish brown, and I wish to prepare it for pipe tobacco.

Yours, etc.,
Potgietersrust, Waterberg. S. W. B. SHEPSTONE.

Answer : I have the honour to acknowledge your letter, and shall be glad to know what kind of pipe tobacco you wish to produce.

2. When producing yellow cigarette tobacco, it is advisable to first sort the same, and afterwards dispose of it to the manufacturer. As regards the ordinary Boer tobacco, I would refer you to the article which appeared in "Agricultural Journal," No. 17 (October, 1906).

3. In your case, if you have large quantities of leaf, I would suggest that it be sweated in the leaf so that the different qualities can be sorted in order that you can supply the particular article required by the different buyers. A better price can, of course, be obtained if you sort your leaf, for you are then able to supply a quantity of a particular kind of leaf.

4. With respect to your inquiries *re* the moistening of tobacco. During the dry season I consider the most practical method is to use

steam in your shed, the shed being so constructed as to render it capable of retaining the moisture. In the rainy season, however, a certain amount of atmospheric moisture is available.

5. After taking down the tobacco in the shed, you should first put down a layer of inferior tobacco, spray it with water, and when the latter is absorbed lay down a few layers of your tobacco taken from the shed, spraying each layer as it is put down. The whole should be covered with blankets to prevent drying out.

6. The above remarks apply only to dark tobaccos, for with this kind of leaf there is not much risk of applying too much moisture ; if, however, an excess of water is applied there is always the danger of the tobacco rotting, whilst in the case of yellow tobacco very little moisture is needed, if too much is applied the leaf loses its value. The correct quantity of water to apply can best be determined by experiments, and cannot be set down in a few words.

7. If you intend to take up the tobacco industry on a large scale, I would advise you to first visit some of the factories, and obtain information as to the class of article for which there is the greatest demand, and you could also get a good idea as to how to properly sort the product.

J. van LEENHOFF,
Government Tobacco Expert.

DESTRUCTION OF POPLAR BUSH.

To the Editor of the Agricultural Journal.

Sir,—I shall be obliged if you will kindly inform me how to destroy a large poplar bush here, which has been cut down, allowed to dry and burnt off, but it seems to thrive on this treatment.

Yours, etc.,

Boschhoek, P.O. Heidelberg. W. BERNARD.

Answer : Your letter to the Editor of the "Agricultural Journal" has been passed to me for reply. I gather that the ground in the neighbourhood of the tree, which you have cut down, is permeated by the roots, and that young shoots continually spring up from these roots.

You could kill the roots, at the expense of rendering the soil sterile, by any convenient plant poison. In such a case the soil would be incapable of supporting plant life for a few months after the treatment.

The following would be suitable poisons to use :—

Carbolic Acid.—Water the ground at the rate of, say, one gallon per square yard with a solution containing 4 oz. of crude carbolic acid to the gallon of water.

2. *Common Salt.*—Water the ground at the rate of 1 gallon per square yard with hot water, in which you have dissolved common salt in the proportion of 2 lbs. to the gallon.

3. *Calcium sulphide.*—Boil 5 gallons of water with 15 lbs. of good lime and add 2 lbs. of flowers of sulphur or powdered roll sulphur; boil until the liquid is almost clear and dark yellow in colour. Dilute with water to 10 gallons and apply from a watering can at the rate of 1 gallon per square yard.

4. *Sulphuric Acid.*—To a gallon of water add 8 ounces of sulphuric acid (oil of vitriol) and supply at the rate of 1 gallon per square yard. This substance is very destructive to clothing, etc., and requires great care in handling. Any one of the above substances would probably be quite effective, and you may use whichever is the most convenient. Of course for common salt you may use the agricultural salt, sold for "licks," etc. I shall be glad to know what success you have in your attempts.

HERBERT INGLE,
Chief Chemist.

Chemical Laboratory, Department of Agriculture.

INSECTS IN CARNATIONS, ROSES AND VIOLETS.

To the Editor of the Agricultural Journal.

Sir,—Would you be kind enough to give me a little advice on the following questions?

1. I have lost a few very good carnation plants during the last year, and on pulling them up I have always found the root perforated, and the perforation running up the stalk. Only in one instance have I found any grub or insect inside this perforation. It was a small black insect, which ran away on being disturbed.

2. What can I do to prevent blight in roses?

3. What can I do to get rid of the red spider in violets. Kaiser Wilhelm, Californian Double White, Princess of Wales have been badly attacked.

4. The Australian bug has appeared on my rose trees during the last week or two. What should I do?

As I am an amateur in growing these three varieties of flowers, I shall be glad of a little assistance.

Yours, etc.,

Pilgrims Rest. WALTER GIBSON.

Answer: Your letter has been forwarded to me for reply.

1. The perforations in the carnation roots may be caused by either wire worm or eel worm. Probably by both. You do not state the age or size of the plants. If more than a year old it is possible that the excessive wet season started the lower roots to decay and the eel worm in that case would very quickly finish the work. I have lost a lot in this way during this season. The treatment in that case is a drier situation. Ashes dug into the ground are used to mitigate the damage caused by eel worms, but in a season such as the last, I fear they would have little effect. Wireworms may be trapped by burying pieces of

carrot just below the surface of the soil in the immediate vicinity of the plants. These should be examined daily, and the worms killed.

2. If by blight you mean the Aphis, paraffine emulsion, 20 pints water to 1 of paraffine, is a good insecticide. A strong soap solution made of 2 lbs. of soft soap to 4 gallons of water is also fairly efficacious. Care must be used that the soap is not too strong. It is best to try on one plant first. The foliage of tea roses is much more delicate than the hybrids. If the blight you allude to is a fungoid growth, you would find a spraying with Bordeaux mixture, during the winter, would check the disease.

3. I fear the work of effectually checking red spider on violets is too laborious to be considered. Red spider can be cured by copious sprayings with cold water, *but* the cold water must be sprayed on to the insects, that is, under the leaves. This spraying would have to be done daily for a week or ten days, and even then a certain proportion would probably escape. Paraffine emulsion would kill them if it could be applied to under sides of the leaves. I think, on the whole, you will find the best way is to remove the infected leaves. If all the leaves are infected clear them off and give the plants plenty of water daily. Of course you will lose a certain portion of the flowering period, but your plants, if young, will not suffer. Violets should not be allowed to remain in one spot for more than three seasons. I find it answers best to have a small bed of young plants made each year, and destroy the three-year-old bed each season.

4. The remedy for Australian bug is the Vedalia ladybird, which usually appears as soon as the bug. If they should become bad in your district it would be advisable to write to the Entomologist (enclosing a sample of the bug) and ask for a few Vedalia, which I believe he has in limited quantity. Trusting these few hints may be of some use to you.

ARTHUR E. BESTER,

Experimental Farm, Potchefstroom. Assistant Horticulturist.

THE MAGGOT FLY.

To the Editor of the Agricultural Journal.

Sir,—Referring to the last issue of the "Agricultural Journal," in which an article on the maggot fly appears, I may state that I have been infested with this maggot. As far as I can remember it must have been about February of this year. I had what I took to be two boils, one on the top of the foot and the other on the thigh. The one on the foot prevented me getting my boot on, so I set to and burst it, and, to my great surprise, out came this maggot. I then took the other out of my thigh. I may say that I took one in to our Railway Medical Officer, Dr. Osborne, and received from him some lotion. The other lived for 24 hours in a pill box, notwithstanding the fact that I put some of the lotion into the box.

Yours, etc.,

Wonderboom, Pretoria North. W. B. DEVONPORT.

EDITORIAL NOTES.

The Union Conference.

THE Annual Conference of the Transvaal Agricultural Union was held at Pretoria on the 26th of August. The proceedings were opened by the Premier, the Right Hon. General Louis Botha, who delivered a most inspiring address in the presence of a large and representative body of farmers and townsfolk, including His Worship the Mayor. The Conference lasted three days, and passed off very successfully. It covered a large and varied field, accomplished much good work, and was marked by a keen desire on the part of every member to promote the best interests of the country. The debates on railways, co-operation, agricultural education and irrigation were unusually interesting and animated, and brought forward many new points for further and fuller consideration.

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The agenda paper consisted of nineteen sections, and touched upon 125 items. Towards the close of the session it became plainly impossible to do anything like justice to a large number of items ; and, consequently, the last afternoon was taken up in merely reading and hastily passing the various resolutions, without any attempt at formal discussion. This was the more regretable as several members had come prepared to speak upon certain matters, which had to be passed over in the most casual manner for lack of sufficient time. We understand, however, that the Executive Committee have already decided to materially curtail the agenda paper next year in order to eliminate the less important items. This, in our opinion, is essential if the Union is to continue to exercise its proper function of influencing public opinion, advising the Government, and keeping the Department of Agriculture in close touch with the real needs of our farming community.

The regulation which enforces a five minutes' limit on every speaker is to be most strongly commended ; and we hope that it will be rigidly adhered to at all future conferences. We were also gratified to note a distinct improvement in the despatch of the business of the meeting, and also upon the fact that the various speakers confined themselves strictly to the several items appearing upon the agenda. In the Transvaal we hear much respecting the value of money ; but the value of time is seldom or never emphasised. And now it remains for us to cordially compliment the retiring President, Mr. J. E. van der Merwe, on the able and earnest manner with which he has conducted the deliberations of this assembly during the past year ; while, at the same time, we congratulate his successor in office, the Hon. A. G.

Robertson ; nor must we fail to heartily felicitate Mr. F. T. Nicholson, the indefatigable secretary, on the high efficiency which the Union has now attained.

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The Premier on Agriculture.

THE Right Hon. the Prime Minister and Minister of Agriculture was warmly received on rising to address the Conference. General Botha spoke as follows :—Mr. President, Ladies and Gentlemen,—It is an unusual pleasure to be present at a meeting representing the agricultural interests of the whole of the Transvaal, and I esteem it an honour to have been invited to declare this Conference open. You have all listened with great interest to the yearly report of the President, which contains much information concerning the work of the Union, and of the Department over which I have the honour to preside. It also refers to many matters which I hope my Department will carry out in the near future. It is, therefore, not necessary for me to repeat what has been already said, or to enter into the details of what has been, and is, to be, done in the future.

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The Union has done much useful work in connection with the question of agricultural co-operation, and is one of the oldest organisations of farming interests. This is my first appearance in your meetings since the close of the war, and I would urge upon the Union the necessity of publishing the results of their labours in connection with the sale of wool, grain, etc., in the form of pamphlets, distributed among the farming population. Do not be afraid of letting people know what you are doing. Urge upon the farmer the folly of selling his wool locally, and teach him to handle this product in such a manner as to enable him to secure the best possible price from the consumer. We must also co-operate for the sale of our mealie crop, on the lines suggested by the Union, and I am pleased to say that I have found a very general desire among the farmers to combine for such purposes. It seems only a little while ago that the word co-operation was quite new in this country, but to-day, no deputation, of the many which visit me, fails to express its belief in the value of co-operation. The Union has worked to create this belief, and I hope that it will continue its efforts and succeed in establishing the movement on safe and permanently beneficial lines. In order to do this the greatest possible care is necessary, and the best possible methods must be adopted. The Government drafted a law dealing with this subject, but when they came to look closely into the matter they felt afraid to proceed without fuller information. Their fear was shared by the people, and the law was withdrawn. We have secured the services of a Danish expert, for a couple of years, and believe him to be a most capable man. We rely upon the Union to render him every possible assistance. The time has come when, if we do not co-operate we shall be lost. I am glad that we

have the Johannesburg market, and hope the farmers will reap the full benefit to be derived therefrom.

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The day is, however, coming when we shall need to export our products. At the present time we are importing articles into this country of a yearly value of some five or six million pounds, and I should be glad to see the day arrive when this condition of affairs will be brought to an end. This vast sum of money must be kept within our own borders, and in addition to this we must export our surplus products. I am sorry to find that the newcomer is attracted only to Johannesburg, where he hopes to speedily reap a fortune, although he may know nothing whatever concerning the gold mining industry. It would be far better if these men would use their money in the development of the land, and thus help to increase our local products and so reduce the cost of living. It is to be regretted that large areas of land are now locked up, and I should hail with the greatest pleasure the day when our population will be increased from 300,000 to a million people. I believe that this can be done, for there is no fault to find with the land itself, nor did we fail, before the war, in raising large quantities of stock. Like Canada and Australia we should seek to increase our agricultural population. I am sorry to see that a large number of white people are clamouring for repatriation. This is an unhealthy state of affairs, and I must protest against a system which leads a man to spend his strength in an unsuitable sphere, and who, when he meets with misfortune, blames the country and desires to be placed outside its borders. If the population is to be permanently increased, it must be through settlement upon the land. This will mean general expansion throughout the country.

In respect of irrigation, we hope to help the farmer, not by the construction of gigantic works, representing millions of money, but by the adoption of moderate schemes, which will be generally useful. Here also the Union has a wide field and can render valuable assistance to the Government. There are four industries which I believe could be beneficially established in the Transvaal. I refer to wool, leather, tobacco, and fruit preserving. At present we are sending vast quantities of raw products out of the country, to be returned to us in the shape of manufactured articles. This is especially true of woollen goods, and articles manufactured from leather. I regret to find a general tendency to prefer the imported to the home-made article. Although the latter may be lacking in finish, the true lover of his country will prefer it to that which is imported.

I hope that the Land Bank will prove a success, and that it will assist in promoting the prosperity of the country through the help which it will be able to afford to the farming population.

We have excellent experimental farms, which have been established for your use. I have just visited the Stud Farm at Standerton, and seen horses of the best possible quality. I have never seen a finer collection of animals. We have also some most excellent sheep and cattle, and we hope that you will assist us to extend their usefulness. I am anxious to see the keeping of second-rate stud stock brought to an end, and the Government, who can do more in this direction than can be done by the farmer, are very anxious that you should visit their farms, and help to distribute the valuable stock to be found there, among the rank and file of the rural population.

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In respect of agricultural education, you will be pleased to see that steps are being taken which we hope will result in an Agricultural College, second to none to be found elsewhere. We must cease to import experts, and must lay ourselves out to raise these from amongst the children of the land in which we live. We contemplate sending half-a-dozen suitable youths abroad to study in the most up-to-date centres, so that they may return, after completing their college course, to assist in the agricultural development of the Transvaal. In this direction we also need your help.

In conclusion, I wish you every success, and expect more from you than I do from the Agricultural Department. The latter only performs the functions of a doctor. It is your duty to find the patients, and to bring them within reach of the doctor's skill. A sum of £161,000 has been placed upon this year's estimates for agricultural purposes. This is designed to furnish the schooling and the teaching which the farmer needs, together with such practical help as may be possible.

I am pleased to see that the question of reorganizing agricultural shows is to be considered by this Conference, and shall be pleased to see a central show held each year, to which the best animals may be sent for exhibition, and subsequent sale. We have too few first-class cattle, sheep and horses, and must endeavour to improve them by every means in our power.

I desire to again thank you for the opportunity of being present, and now declare the Conference opened, whilst wishing you every success in connection with your labours.

During two of the evenings of the Congress short scientific lectures were given by the Director of Agriculture, the Government Veterinary Bacteriologist, the Zoologist to the Museum, the Entomologist, the Government Tobacco Expert, and Major Huneberg, which, judging by the full houses, were highly appreciated by the members and their friends.

Agricultural Education.

"Agricultural Education and Research" formed the subject of the important address delivered by Mr. F. B. Smith, the Director of Agriculture, in the presence of a most representative audience, which included the Premier, the Right Hon. General Louis Botha, and the Colonial Secretary, the Hon. J. C. Smuts. Mr. Smith has always urged the need of a sound and comprehensive system of rural education for this Colony, and his able and instructive lecture before the members of the Union was listened to with the most earnest attention. Indeed, it is not too much to say that no one left Hartley Hall without a clearer conception of the splendid progress which agricultural education has made in other parts of the world; and fired with a determination to see that something should be done without delay for the youth of the Transvaal.

We much regret that we cannot reproduce, for the benefit of our readers, the admirable lantern slides which were thrown upon the screen by Mr. Herbert Ingle, the chief chemist to the Department. For without them no just idea can be formed of the noble halls, the broad acres, the splendid laboratories and the pedigree herds at the command of those fortunate students in most of the greater colleges of Europe and America. In passing, however, we should like to mention some of the illustrations, the majority of which depicted the Agricultural Colleges of America.

The first few slides dealt with the Agricultural Institutions and State Stations of Hungary, Germany and Sweden; and then Mr. Smith passed to the United States, and spoke of the Agricultural Colleges of Iowa, Michigan and Cornell. In this issue, Plates 2 and 3, show the students at work in the Wisconsin Agricultural College. This is one of the best known of the Western Agricultural Colleges, and will always be remembered as the home of Dr. Babcock, the inventor of the famous milk tester. The College Barn of Kansas, with silos attached, was also shown. The lecturer made a few remarks upon the American Barn, emphasising the fact that it is practically an entire farm homestead concentrated under one roof in such a manner that the farmer can attend to the maximum number of live stock with the minimum amount of labour.

We also reproduce a photograph (Plate 4) of the Utah Agricultural College, with the Wasatch range of the Rocky Mountains in the background. This college, as becomes an institution situated in a State largely composed of desert lands, is foremost in the study of Irrigation and Dry Farming.

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Turning to the Old Dominion, Mr. Smith showed the Macdonald Hall, Guelph, Ontario, Canada. Guelph is one of the best known Agricultural Colleges, and has exercised a great influence in Canada, both on account of its *in* college and *out* of college work. Next, and in our New Dominion, was pointed out the Canterbury Agricultural

College, Lincoln, New Zealand, which, following the principle adopted in the United States of America, was endowed with 62,000 acres of land, the revenue from which goes to the upkeep of the college. Mention was also made of the well-known Australian Agricultural College at Hawkesbury, and of the famous new college erected at St. Anne's, Quebec, and endowed by Sir William Macdonald with the princely gift of $1,000,000.

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Tropical Diseases.

Another illuminating lecture delivered during the Congress was the address by Dr. Theiler, the Government Veterinary Bacteriologist, on Recent Researches in Tropical Diseases. The lecturer did not confine himself to his own special work at the Daspoort Laboratories, but gave a masterly review of the whole subject of tropical disease in the light of the latest science. Dr. Theiler spoke of the proceedings of the International Veterinary Congress at Buda-Pesth, which he attended as a delegate, and, in passing, mentioned that the subject of tropical diseases was first placed on the agenda paper only two years ago. However, the importance of tropical veterinary medicine was so fully recognised at the Congress that a resolution was passed urging the great Colonial Powers to establish special chairs at their Veterinary Colleges for the teaching of this branch of science ; and our readers will be interested to learn that the gentleman nominated to this professorship in Germany was sent to study in South Africa, and is at the present time pursuing his investigations at the Bacteriological Institute at Pretoria. In connection with the London and Liverpool Universities post-graduate courses are offered to veterinarians who propose entering the Colonial service. But so far as we are aware the only college for the study of the subject on the American Continent is the institution recently erected at Buenos Ayres.

Tropical veterinary science covers a stupendous field, and must, therefore, be treated as a special subject, not only on account of its vastness, but owing to the peculiar manner in which tropical diseases are propagated. With the better laboratory facilities which are now afforded by the establishment of the new Veterinary Bacteriological Laboratories at Onderstepoort, Pretoria, we may confidently look forward to the final solution by Dr. Theiler and his staff of many of the present obscure problems which abound in this fascinating field of research.

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On Tobacco.

Mr. J. van Leenhoff, the Government Tobacco Expert, read before the Union an instructive paper on the Tobacco Industry. He sketched the development of disease resistant strains by breeding, and showed the value of combining the hardiness and heavy yielding qualities of the native types with the fineness and fragrance of the imported

varieties. Mr. van Leenhoff stated that the establishment of a co-operative central warehouse would serve as a direct improvement, not only in the sale price, but as leading to a greater uniformity in the production of the different tobaccos, which again would enhance the reputation of the finished Transvaal product. Advances could be made on consignments received from farmers, which would then be sorted, classified, baled, and marked, and samples sent out preparatory to the sale. With regard to markets, the South African market at present pays higher prices than any in the world, and the value of tobacco imported into the Transvaal was £220,610 in 1905, and £249,604 in 1906, while in the latter year the whole of South Africa imported from oversea £315,397 worth. In conclusion, Mr. van Leenhoff considered that the Transvaal can supply a product to compete successfully with the imported article on the local markets, and that a preferential tariff might increase the demand in the neighbouring Colonies. An endeavour should be made to keep the manufacture in the Transvaal instead of allowing it to find its way to the coast. A central warehouse would induce the farmer to grow a high class of tobacco, as only good leaf would be accepted, and co-operation among planters would stimulate the application of better methods, and would also enable them to reach the markets more easily.

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The Poultry Industry.

MAJOR HUNEBERG's paper on the Poultry Industry was listened to with much attention by the members of the Union. The Major discussed the profits to be derived from the poultry industry under four heads, viz., egg production, flesh production, feather production and manure production. Speaking of the various breeds the Major remarked that the Mediterranean breeds, such as Minorcas, Andalusians and Leghorns, are generally recognised as being the fowls best adapted for egg production pure and simple. They are not table fowls. There is, however, the general purpose fowl, which, although being neither the very best layer nor the very best table fowl, goes a long way towards giving satisfaction in both directions. In this latter class one would include Wyandottes, Plymouth Rocks and Orpingtons as most suitable to our climate. The Wyandotte, especially the white and the silver varieties, are most excellent winter layers, and make splendid table fowls, their flesh being juicy and in every way desirable for the table. The Plymouth Rock, whilst losing somewhat in the point of egg production, gains, by reason of size, as a table bird, and the same may be said of the Orpington. The varieties named as general purpose fowls can be further used for breeding, as they make excellent mothers, while the Mediterraneans, being non-sitters, lack this quality, and it becomes, therefore, necessary to breed by artificial means where those breeds only are kept.

It is worth noting that for the first six months of the current year we have paid £65,000 for imported eggs, £30,000 for live poultry, and £17,779 for frozen poultry, or a total of £112,779 for the half-year. And, as Major Huneberg remarked, not only should we be able to produce every one of the eggs and fowls consumed in the Transvaal, but we should so increase our egg production as to secure a share of the eight and a half millions which Great Britain annually spends on imported eggs. If the Australian States can do so, it is hard to see why the Transvaal cannot do likewise, since the distance to London is much less than from Australia. We can always count on obtaining 2s. per dozen for fresh eggs, and taking a hen as laying at the average rate of at least from 100 to 120 eggs per annum, the profit to be derived from the egg industry is at once apparent. The lecturer closed his suggestive paper with a word on the advantages this industry offered to delicate women who need an open-air life, as well as the interest it creates amongst those who are forced to live isolated lives on outlying farms. The Transvaal has no monopoly of diseases amongst poultry, and with ordinary care, the dissemination of knowledge by means of lectures, and the distribution of printed leaflets, there is no reason to doubt that we can raise better poultry and more eggs.

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The Entomologist.

Agriculturists of the Transvaal will be interested to learn that Mr. Charles Walter Howard has been raised to the important post of Entomologist to the Department. Mr. Howard succeeds his countryman, the late Mr. C. B. Simpson, whose untimely demise in the midst of his labours was universally deplored. We are confident that the campaign against locusts will be carried forward to a successful issue under the leadership of Mr. Howard; and we may certainly assume that the Entomological Division can count on the loyal support of all farmers, field cornets, and the rural community in general. Mr. Howard was born at Ogdensburg, in Northern New York, and, after pursuing his studies at the High School, won a State Scholarship to the University of Cornell, where he graduated B.A. in 1904, taking special work in Entomological Science. After acting for a year and a half as assistant to Professor Cormstock, of Cornell, Mr. Howard was, on the recommendation of the American Government, appointed to the Transvaal in 1905.

In passing, it may be remarked that his *alma mater*—Cornell—has trained more than three-fourths of the Economic Entomologists of America. Indeed it may be truly termed the Mecca of Insect Sciences. Mr. Howard delivered a timely lecture on "Locust Destruction" before the Agricultural Union; and at the present moment he is touring the Transvaal making final arrangements for the forthcoming locust campaign.

The Assistant Chemist.

THE Division of Chemistry, under Mr. Herbert Ingle, Chief Chemist, has been strengthened by the appointment of Mr. R. D. Watt as Assistant Chemist. Mr. Watt is a Scotsman, the son of an Ayrshire farmer, and is consequently well acquainted with the theory and practice of agriculture. Mr. Watt has had a most distinguished Academic career at the University of Glasgow and the West of Scotland Agricultural College. He holds the degrees of M.A. and B.Sc. (Agriculture) of the University; the National Diploma in Dairying, and was awarded the gold medal and the highest honours in the final examination for the National Diploma in Agriculture. In the year 1905 Mr. Watt was granted a Carnegie Research Scholarship and pursued his further studies at the famous Experiment Station of Rothamsted, where he published an interesting paper on "The Gas evolved in Churning." ("Journal of Agricultural Science," Vol. II., No. 1.)

Coming, as he does, from the most renowned dairy county in Scotland we have no doubt our farmers will be glad to avail themselves of Mr. Watt's expert knowledge, more particularly in the field of dairy chemistry—so rich in puzzling problems. We hope to publish the first of a series of articles from the pen of Mr. Watt in our next issue.

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The Director of Agriculture, British East Africa.

ALL our readers will unite with us in heartily congratulating the Assistant Director of Agriculture, Mr. A. C. MacDonald, on his appointment to the important post of Director of Agriculture in British East Africa. Mr. MacDonald has long been officially connected with the farming industry of South Africa; and ever since he entered the service of the Transvaal Government he has laboured unceasingly in the cause of agriculture. Although we deeply regret his departure from the Department we are glad to think that his services will still remain at the command of the Crown in a Colony which, in the fullness of time, will doubtless be admitted into the ultimate confederation of Central and Southern Africa.

British East Africa comprises 177,100 square miles, and is therefore as large as the combined area of the Transvaal, Orange River Colony and Basutoland. The population comprises some 4,000,000 natives, 25,000 Asiatics, and 2,000 Europeans. Live stock thrive splendidly upon the rich grass lands of the uplands, whilst all sorts of tropical cultures, such as cotton, coffee, tobacco, bananas, fibres and rubber grow luxuriantly in the damper, warmer, and lower lying portions of the littoral region. It will thus be seen that Mr. MacDonald's new sphere of labour lies in a land which is destined to become one of the richest agricultural States in Africa, and we are confident that he will lay the foundation of a lasting agricultural industry in this part of His Majesty's Dominions.

A few days before Mr. A. C. MacDonald left Pretoria to take up his new post the staff and members of the Department entertained him at a banquet. And the following quotations clearly show the high esteem in which he was regarded both by his colleagues in the Agricultural Department and the representative members of the rural community. The Premier and Minister of Agriculture, the Right Hon. General Louis Botha, wrote as follows :—

"I regret exceedingly that I am compelled to leave Pretoria this evening on important business, and that it will be impossible for me to attend the dinner which the Agricultural Staff is giving to Mr. MacDonald on the eve of his departure for British East Africa. I, however, wish to take this opportunity of expressing my appreciation of the very valuable and excellent services rendered by Mr. MacDonald to the Agricultural Department and to the farming industry in South Africa during his seventeen years' career in the different South African Colonies, and to wish him every success in the work which he is now going to undertake. I also feel sure that his departure will not only be considerably regretted by his most intimate friends, but also by those who have learnt to value his good fellowship and sound judgment in the execution of his various duties."

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Mr. J. E. van der Merwe, the President of the Transvaal Agricultural Union, in his last annual report, expressed the feeling of the farmers: "The resignation of the Assistant Director of Agriculture, Mr. A. C. MacDonald, demands a word of appreciation of his work from me, as President of this Union. His long experience of South African agricultural methods, and his devotion to the duties of his office, did much to promote the lasting interests of our industry. I am but expressing the feeling of the members of this Union when I venture to wish him every success in his new sphere of labour in British East Africa, where he is filling the position of Director of Agriculture."

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The Work of the Irrigation Department.

For some time past the Irrigation Department has been mainly occupied in inspecting the irrigation works of farmers, and advising them as to the best method of using their water. Numerous applications have been lately received from farmers asking that engineers should visit their farms. In the majority of cases the engineers were asked to advise as to the best means of remedying some defect in a dam or water furrow. In almost every case these defects are rather difficult to correct once the works have been constructed, but are such as could have been easily prevented if proper precautions had been taken in the first instance. It is hoped that any farmers who may contemplate the construction of irrigation works, large or small, will communicate with the Irrigation Department before actually undertaking them. Advice costs little or nothing, and it is always to the advantage of the farmer

to know what the results of the work he proposes to do are likely to be, so that he may spend his money to the best advantage.

The Boring Branch of the Department has, during the three months of April, May and June, of this year, sunk some 47 holes for farmers, of an aggregate depth of 2,697 feet, and a total supply of about 776,000 gallons per day has been thus obtained. The average cost (excluding administration charges) to Government of sinking these holes was 13s. 1d. per foot, and of this amount the portion payable by the farmers worked out for the same period at an average of 5s. per foot.

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The Ermelo Stud Sheep Farm.

An important addition has recently been made to the flock of pure bred Tasmanian Merinos on the Ermelo Experimental Farm by the importation of 8 rams and 285 ewes purchased and imported direct from the best studs of New South Wales by the Agricultural Department. In selecting these sheep great care has been taken to acquire sheep of exactly the same strain and family as those already on the farm, and in doing so a flock has been secured by the Department that carry all the best characteristics of their breed both in uniformity of frame and evenness of covering.

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Soundness of constitution has also been carefully studied. A clear proof of the hardiness of this particular consignment is shown by the fact that notwithstanding the long railway journey to the seaport in Australia, a rough voyage of close on 7,000 miles, and finally four days in the railway trucks from Durban to Ermelo; less than four per cent. succumbed during the whole journey. This mortality was only caused through very bad weather at sea, rain, freezing winds, and continual heavy seas breaking over the decks and flooding the sheep pens. It may be mentioned that one of the storms encountered during the early part of the journey was so severe that the master of the vessel deemed it necessary to put the ship about and run nearly 60 miles before the wind in order to prevent the decks from being swept clean. Since arriving at Ermelo on the 12th June not a single sheep has died or suffered in any way from the effects of their six weeks' confinement and hard treatment.

The class of the importation is as follows :—

8 rams pedigree stock by sons of *President*, the 1,600 guinea champion of the Sydney Stud Sheep Show in 1896 ; 50 stud ewes, pedigree stock by sons and descendants of *President* ; 235 stud ewes, high class, of the same family and breeding.

The wool on the above sheep is the finest class of combing, showing both splendid colour and evenness. The structure of the wool is of the highest order, the crimps well defined, carried out to the tip, and numbering from 22 to 30 to the inch. The sheep carry the pearl tip, which is a sure sign of the highest quality of wool. In general appearance the sheep are not too wrinkly ; as it is known that very wrinkly sheep tend towards weakness of constitution—an all important point in sheep breeding. When purchasing this flock, Mr. V. Bossley, the manager of the Stud Sheep Farm and representative of the Department, travelled several thousand miles in order to secure the best sheep available—buying only after mature consideration of the class offered for sale.

In introducing these sheep into the Transvaal the Agricultural Department has gone direct to the fountain head of the acknowledged Australian Merino, for which it can be justly claimed that it has no compeer in any part of the world for quality, quantity and texture of wool. This high position was reached mainly through the able assistance of the stud masters of Tasmania. In the beginning of the last century, a company, the Van Dieman's Land Company, secured a large area of country at Circular Head, and expended £30,000 in the importation of pure Saxony Merinos. The company, in 1830, were in possession of 60,000 sheep, including lambs. Looking back at the records for high prices paid for stud sheep during the last decade, not only for their beautiful wool, but for their constitutions, we see that by scientific breeding, careful classing, and sound judgment, the Tasmanians have surpassed breeders of all other countries, producing from their imported stock an all round wonderfully improved Merino sheep.

What the Tasmanians have succeeded in doing the Transvaalers can do also. For granted that there are more diseases and other troubles to contend with in this country than there were in Tasmania in 1830, still our sheep breeders have now the advantage of starting their flocks from a much higher class of animal than could be possibly secured in the earlier part of last century. Too much care cannot be taken in the selection, classing, and general improvement of sheep in this country, as has often been pointed out in this "Journal" ; and it is very gratifying to find that there are now many sheep breeders in the Transvaal who ardently desire to improve their flocks. All honour to them. For the establishment of a successful wool industry means the permanent prosperity of the Transvaal.

The South African Association for the Advancement of Science.

THE Fifth Annual Session of the South African Association for the Advancement of Science was held in Natal last July. The President for the session was Dr. James Hyslop, D.S.O., who delivered his address in Maritzburg. Dr. Hyslop dealt mainly with the recent great advances in preventative diseases, and quoted as a telling example the recent campaign against the natives in Natal, during which only two white combatants succumbed to such diseases. The meetings, both in Maritzburg and Durban, proved a great success, the number of Transvaal visitors was large, and the hospitality extended to the Association by the Municipal Authorities at both Maritzburg and Durban was much appreciated. As usual, the Railway Departments issued return tickets to members, so that an economical, instructive and thoroughly good time was enjoyed. Looking chiefly at the agricultural aspect of the meeting, we may refer to the excursions to the Government Farm at Cedara, near Maritzburg, the Botanical Gardens at Maritzburg, the Natal Laboratories, where Dr. Watkins Pitchford is conducting experiments in preventive serums for horse and cattle diseases, the Mount Edgecombe Sugar Estates, where the whole process of sugar manufacture is carried out, and finally a visit to the well known Safco Fertilizer Works, etc. Some valuable papers dealing with agriculture in South Africa were read and discussed. Colonel Rawson read an interesting paper on the movements of anticyclones as influencing South African weather. *Mr. Wood, of the Transvaal Meteorological Department, contributed a paper on the peculiarities of the rainfall of this Colony.

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The British Association has handed to the South African Association 12 medals and a die with a sum of money yielding about £55 a year for the purpose of awarding a medal and also a sum of money for achievement and promise in scientific research in South Africa. Rules have been carefully drawn up so as to ensure that the awards be made carefully and a high standard maintained, so that the recipients of this, the first purely South African medal, will feel that it is a high honour to receive an award. The Medal Committee is composed altogether of 12 members residing in the four Colonies of South Africa, and, needless to say, a member of the Medal Committee is ineligible for an award of the medal. The first award, if any, will be made at the next annual session, which will be held in Grahamstown under the presidency of H.E. Sir Walter Hely Hutchinson, the Governor of Cape Colony, who will deliver the presidential address.

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The annual volume of the Association for 1906 has recently been issued. It contains, amongst other things, the following papers on agricultural subjects :—

Death-feigning Instinct in the Ostrich (by Professor Duerden) ;

On some aspects in the Vegetation of South Africa which are

due to the Prevailing Winds (by Dr. Marloth); Sunrise and Growth (by Colonel Rawson); Note on Fusicladium: Affecting Apples and Pears (by J. B. Pole Evans); The Realm of Alfalfa (by S. Hodder, F.R.C.T.); South African Horticulture (by T. R. Sim); Irrigation and Inter-colonial Co-operation (by W. L. Strange); Irrigation in Egypt and South Africa (by F. A. Hurley); Farm Irrigation (by C. Dimond H. Braine); Botany as a School Subject (by Dr. Schonland); Agricultural or Land Banks and Agricultural Co-operation (by J. R. Barker); etc., etc.

When it is considered that these valuable volumes, as well as all the other privileges of the Association, including reduced railway fares to the annual sessions, can be secured by a payment of only 20s. a year, it seems strange that the Association should have so little support. Any of our readers who would like to know more about the Association should send a postcard to the Assistant Secretary, Mr. F. Rowland, P.O. Box 1183, Johannesburg.

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On Steam Cultivation

THE principle of co-operation is extending so quickly to all branches of agriculture that we are rather surprised the advantage of co-operative steam ploughing has not been urged before. At any rate with the vast stretches of untilled land in this Colony, where dry land farming is alone possible, it is certainly worth serious consideration. Any of our readers who are interested in this subject would certainly enjoy a visit to the Vereeniging Estates. Most farmers are compelled to wait for the first favourable rains in order to start their ploughing. But with steam tackle it is possible to plow practically the whole year round. The accompanying illustration (Plate 10) shows the cultural methods adopted by Mr. W. A. McLaren, M.I.Mech.E., the South African manager for the well-known firm of agricultural engineers—Messrs. John Fowler, Ltd., Leeds, England. The Vereeniging Estates, the property of Messrs. Lewis and Marks, about which we have already spoken in a former issue of this "Journal," afford special facilities for demonstrating the advantage of steam cultivation on large areas.

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The first season's crop reaped by Mr. McLaren was some 6,000 bags; the second 10,000; while the present or third is estimated at 15,000 approximately. The land now under crop was almost all virgin veld, and consequently required much labour to get it into good tilth. Moreover, each year a large amount of new veld is broken up, which materially increases the relative cost of the tillage operations, as to plough up new ground is naturally a much harder job than to replough old lands. And, further, the Vereeniging veld is hard to work in comparison with that of the Eastern Transvaal. In the district of Bethal, for instance, a Fowler tackle ploughed up 3,300 acres in seven

months, or about 500 acres per month. The best lands have yielded as much as 12 bags per acre. This year 2,400 acres were put under crop, a great part of which is new veld. Next season operations will be conducted on a still more extensive scale, and it is hoped that some 4,500 acres will be laid under maize ; so it will be seen that Mr. McLaren can justly claim to be the largest agricultural farmer in the Transvaal.

The method of breaking up new land is as follows : As soon as the last of the mealies are planted, say, in November, the breaking up of new lands is commenced, with a good furrow, about 12 inches deep by 16 inches wide. Then the land is ploughed, with the consolidator hung on behind the plough. The ploughing tackle consists of two engines—with steel cables 450 yards in length—a five-furrow balance plough, and the consolidator weighing about two tons. The final operation takes place at seeding time in the latter end of September, when the planting is done by means of the combined implement consisting of a 24-tine cultivator, a consolidator, the planting coulters, and a harrow hung on behind ; the four operations being all done by the single combined implement, which has a capacity of 60 acres per day. To illustrate, let us take 1,000 acres of virgin veld. This land might be fitted and planted with the above-mentioned tackle in the matter of six months, or, say, 2,000 acres in one year. The staff required would be three white men and a few natives. The cost of this tackle, including a sleeping van for the men, would be £4,500 (approximately). Even in the driest season a crop (locusts excepted) of six bags per acre might safely be counted upon. That is to say, 2,000 acres at 6 bags = 12,000 bags, at 10s. per bag = £6,000. So that on large areas it would not take long to pay for the first cost of a steam plough. Furthermore, by the recent gratifying reduction of railway rates the way is now open for placing our surplus mealies upon the London market.

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The mealie harvesting outfit used by Mr. McLaren is particularly interesting, and is an entirely new departure in the agricultural world. (See Plate 11.) This harvester, which costs about £1,000 complete, is manufactured by the same firm, viz., Messrs. John Fowler, Ltd., of Leeds, and is driven by an eight-ton traction engine, which moves through the fields at the rate of about one mile per hour. This travelling harvester not only saves a great amount of labour, but it also keeps the native pickers surprisingly active in their efforts to keep in front of the machine. Forty boys are employed, and the mealie cobs with the husks attached are rapidly gathered in bags and tossed upon the front platform, where they are poured into a hopper and are taken up the cob elevator, where they pass through the revolving sheller. The dressed grain falls into sacks on the rear platform, while the "blaar" pours out on the off side of the machine. On the rear platform the bags are filled, weighed, sewed, and finally tumbled off

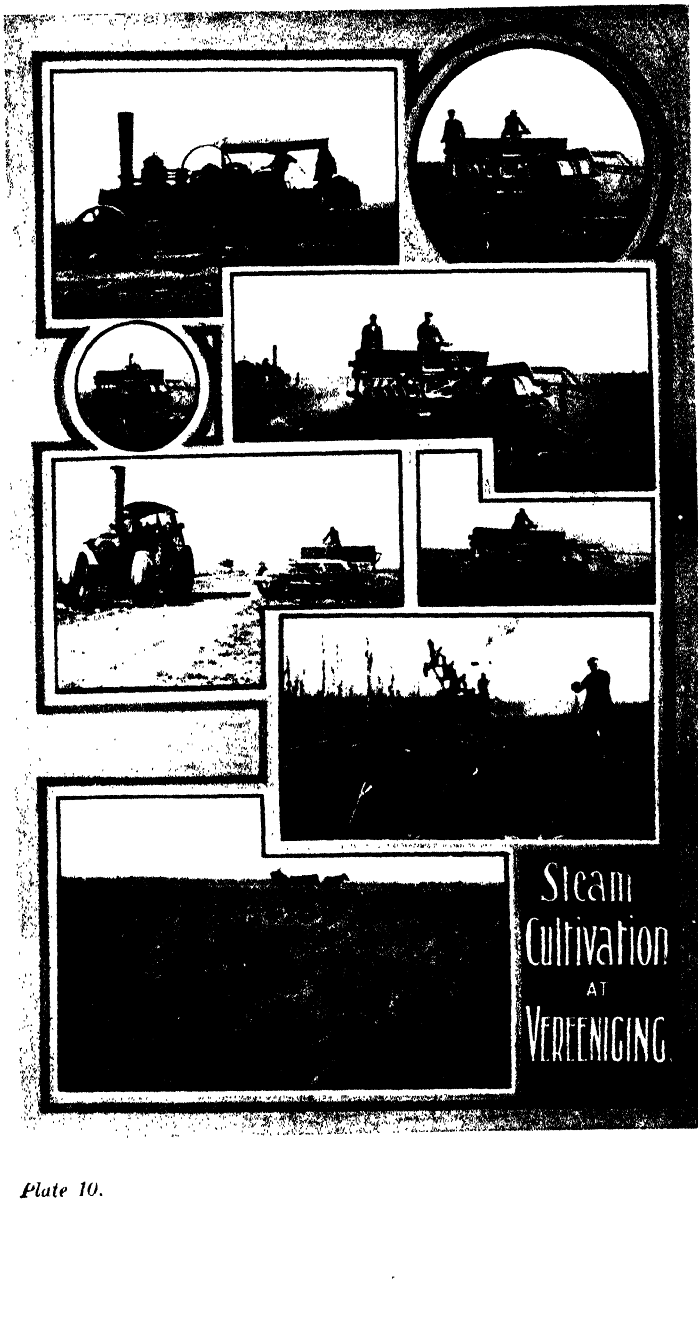


Plate 10.

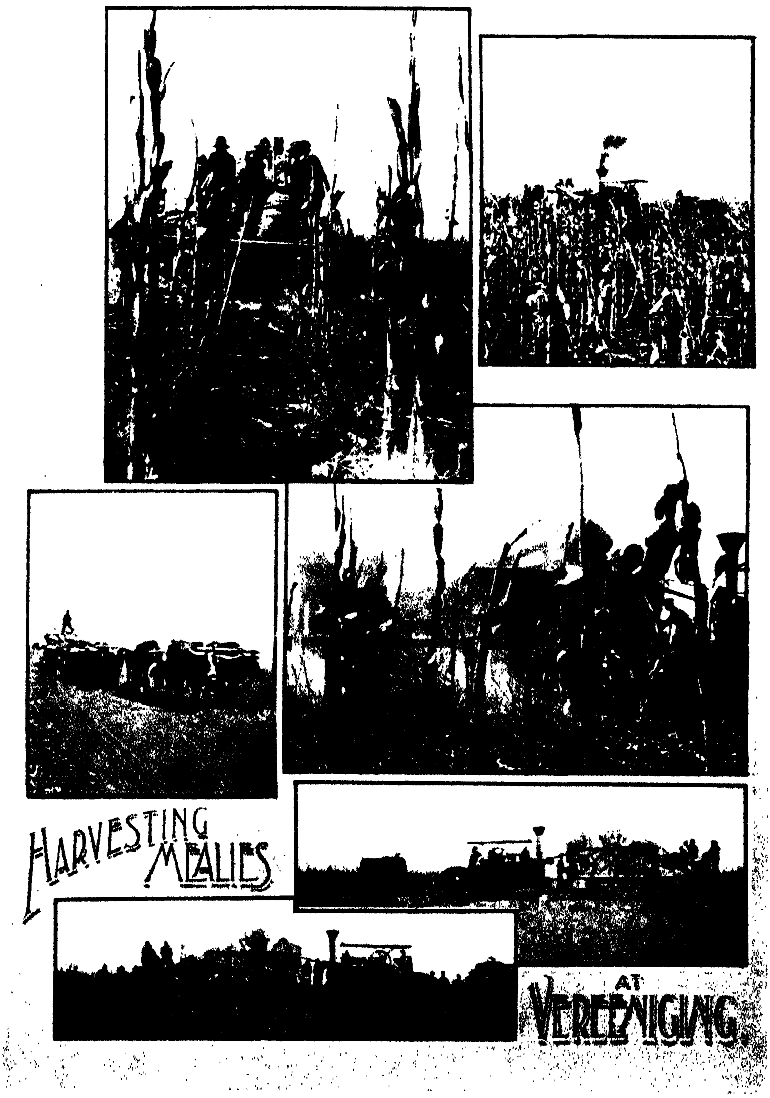
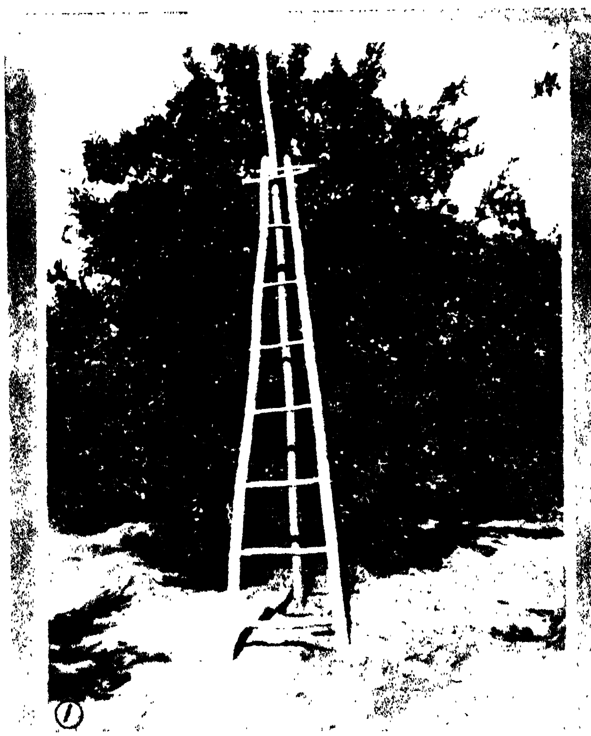


Plate II.

Plate 12.

Fig. 1.—A well-loaded Naartje Tree at Warmbaths.

Fig. 2.—A sturdy seedling; burnt by grass fires and still bearing.



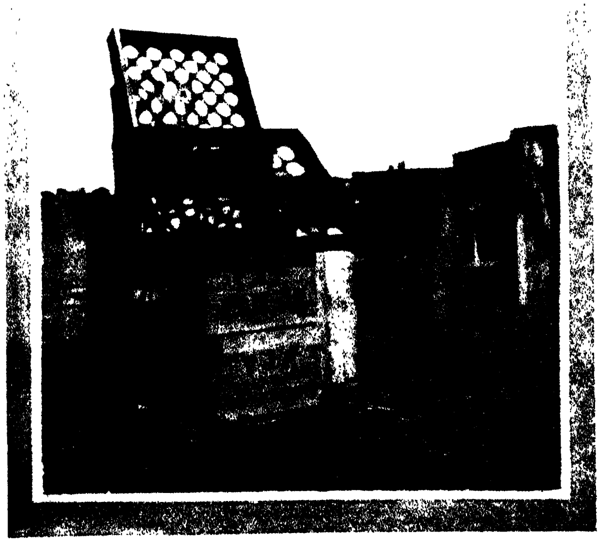


Plate 13.

FIG. 1. - A handy ladder for picking oranges.

FIG. 2. --A home-made grader.

the moving machine, to be picked up by the ox-waggons plying to and fro from the lands to the station store. For the efficient and economical reaping of large fields we know of nothing to equal this machine. The capacity of the harvester is from 400 to 500 bags of mealies per day.

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Agricultural Statistics.

On several occasions in this "Journal" it has been necessary to lament the absence of comprehensive statistics of the progress of agriculture and stock breeding in this Colony. Without such statistics it is impossible to institute reasonable comparisons between different periods, and to ascertain definitely if an increase in the wealth of our rural population is actually being made. There is every reason to believe that such progress is taking place in some directions, but that conclusion is based very largely on personal observation in different parts of the country.

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An organisation to collect and publish facts and figures bearing in any way on agriculture will soon become absolutely necessary. The question which confronts us at present is how far does our agricultural productiveness exceed or fall short of the local requirements of the country? The export of certain produce is already being spoken of as a necessity of the near future, but are we able yet to supply our own wants? In his report for 1905-6, Mr. F. B. Smith, the Director of Agriculture, gives a table of the mealies, oats, oat hay and lucerne supplied to the Army during the twelve months ending 30th June, 1906, which shows the extent to which we have had to fall back on the Cape Colony to complete the quantities required. No less than 788 tons oat hay, 852 tons oats, and 582 tons lucerne were purchased in Cape Colony for the Pretoria and Potchefstroom Garrisons alone! The actual quantities required annually by the Army, South African Constabulary and C.S.A.R. and Government Departments is hardly realised. But large as the consuming capacity of these public bodies undoubtedly is, it is, of course, not unlimited, and care must be taken to avoid "glutting the market." More than forty years ago the United States Government recognised the utility to the agriculturist of statistics relating to the supply and demand of farm crops.

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To assure a profit to the producer, a reasonable equilibrium between supply and demand must be maintained, and this can, in a large measure, be given by timely information to farmers of those particular conditions that affect the marketing of produce. America recognises that this can best be done by the State, but the information must come, in the first instance, from the individual on whom lies the responsibility of detail. In the April issue of this "Journal," Mr. H. E. King pointed out the advantages of a good system of farm book-keeping; but to supplement that it is necessary that returns be kept by the farmer of any figures either in the aggregate or in the particular

which are likely to be of benefit to the community in general. We know, for instance, the total area of this Colony, but not the average amount of land under cultivation, and much less that under any particular crop, so that the extent of our resources can only be roughly surmised. Unfortunately, in the past, there has been a disinclination on the part of a section of the farming population to supply figures reflecting the yield of their farms or the size of their flocks and herds. This apparently arose from a suspicion that the information was required for purposes of contemplated taxation; but it is earnestly hoped that this fear will not continue to exist, and that the utility and necessity of statistics will become evident.

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On Grafting.

PLATE 14 shows some interesting experiments in grafting in the garden of Mr. E. H. L. Gorges, the Assistant Colonial Secretary, Pretoria. Mr. Gorges is an enthusiastic amateur horticulturist, and has been singularly successful in his grafting operations.

Fig. 1 shows a Transvaal Yellow Peach grafted over to the Elberta, Pallas and Waldo varieties in August, 1906. The photograph was taken in July, 1907, and shows a growth of 11½ feet in one season. Fig. 2 shows the Transvaal Yellow Peach grafted to Japanese Plums, comprising such well-known varieties as Wickson, Burbank, Satsuma, Abundance, Ogon, Chabot, Shiro Simomo, Kelsey and Red June. Of 34 scions inserted, 33 struck—an extraordinary large percentage. In "Journal" No. 14 (January, 1906), page 461, we gave an account of some of our experiments showing that there was a certain amount of barrenness or self-sterility amongst the peach trees imported into this Colony. And we may remark here that those of our readers who possess non-bearing peaches could not do better than to insert a few grafts of proved bearing strains in their particular locality before finally deciding to root out trees which have been standing for the matter of five or ten years. Many an unproductive orchard has been made fruitful by being partially or wholly top-worked to another variety.

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Collect on Delivery System.

WE should like to direct our readers' attention to what is known as the "Collect on Delivery" system applicable in local traffic and through traffic with the Cape and Natal Government Railways in through traffic with the Beira and Mashonaland Railways for stations in Rhodesia, and in through traffic with Rhodesian Railways (Vryburg-Bulawayo Section).

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The system is briefly this—the Railway Department collects from the consignee the declared value of consignments (other than live stock) on delivery of same, on behalf of the sender, the Receiving Station remitting the amount through

Plate 14.

FIG. 1. Yellow Peach grafted over to Elberta, Pallas and Waldo.

FIG. 2. Yellow Peach grafted over to Japanese Plum (nine varieties).

One season's growth.

the Sending Station to the sender. The rates of commission for collecting from consignees on behalf of sender the amount to be recoverable in respect of the value of the consignment are, viz:—Locally over Central South African Railways and in through traffic with Cape Government and the Rhodesian Railways (Vryburg-Bulawayo Section):—

	£	s.	d.			Pence.
Not over	0	6	8	..	Commission	.. 1
,, ,,	0	13	4	..	,,	.. 2
,, ,,	1	0	0	..	,,	.. 3
,, ,,	2	0	0.	..	,,	.. 4
,, ,,	5	0	0	..	,,	.. 6

Each additional pound or part thereof 1d.; maximum £100. In through traffic with the Natal Government Railways and Beira and Mashonaland Railways the rates of commission are as above with the exception that the minimum charge made is 3d. These rates are payable even though the collection of value is not effected, to recompense the Department for services which, though ineffectual, will exceed those rendered if the consignment were delivered in the first instance.

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A sender wishing to take advantage of the "Collect on Delivery" system will hand the package, fully and legibly addressed, which he wishes forwarded, to the officer at the sending station appointed to receive the same, together with a consignment note, which, in addition to the usual particulars must show the amount to be collected from the consignee for and in respect of such package, irrespective of railway freight, any special instructions regarding delivery, etc., he desires carried out, together with an account giving details of contents of such package or packages.

Moreover, in order to meet the convenience of merchants, etc., not having sufficient traffic to warrant the opening of a ledger account with the Department, it has been decided to accept deposits at stations to meet freight on goods either forwarded or received. Further information in regard to these arrangements can be obtained from the Stationmasters at any station in the Transvaal or Orange River Colony.

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On Ramie Growing.

WE are indebted to Mr. D. Edwards-Radclyffe, the Hon. Secretary of the Ramie Growing Association, Staines, England, for forwarding us a circular respecting the first organised attempt to bring the cultivation of ramie to the notice of agriculturists in all parts of the British Empire. A powerful Committee has been formed which includes such representative men as His Grace the Duke of Argyll, Sir Harry H. Johnston, and the Rt. Hon. Dr. Jameson, Premier of Cape Colony.

From this circular we learn that, at the present time, ramie is grown largely in China and in smaller quantities in different portions of the British Dominions. It is a fibre which, for general utility, is without a rival, providing one of the best of clothing materials, being a non-conductor of heat, and, consequently, cool in the sun's rays and warm in winter. It is beautifully lustrous, in this respect resembling silk, and retains its lustre undiminished after washing. It is exceedingly durable, and resists the roughest handling in laundry operations. Ramie is equally suitable for ropes and cordage, nets, tent cloth and all forms of coarse material for which hemp or jute is now commonly used, and is much stronger and more lasting than either of these fibres.

Incidentally, we may mention that ramie has been grown by the Transvaal Department of Agriculture on the Experiment Stations at Tzaneen and Pretoria, but it is as yet too early to recommend the extensive cultivation of this fibre. It grows well and seems to be adapted to the warmer districts of our Colony.

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Cattle Medicines.

THROUGH the kindness of Messrs. A. Johnston & Co., Pretoria, the Agricultural Department has been presented with sample cases of cattle medicines prepared by the well-known firm of Messrs. Day, Sons & Hewett, 22, Dorset Street, London, W. These cases have been sent to the Experimental Farm, Potchefstroom, and to the Stud Farm, Standerton.

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Transvaal Soap.

IT is always a pleasure to call attention to the progress of any local industry, and we are glad to learn that the Transvaal Soap Company, Ltd., P.O. Box 3248, Johannesburg, is prepared to purchase considerable quantities of tallow for the manufacture of soap. We hope that the day is not far distant when other factories will be established to supply our local needs both in food and clothing.

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Lawn Grass Mixtures.

MR. H. Godfrey Mundy, Assistant for Seed and Plant Experiments, asks us to insert the following notice:—

"Owing to the large and increasing demand for grass seed, it has been found necessary to discontinue the issue of *Lawn Grass Mixtures.* Grass seed suitable for this purpose, namely, Perennial Rye Grass, Tall Fescue and Italian Rye Grass can usually be obtained from local seed merchants."

An Agricultural Explorer.

Mr. Joseph Burtt-Davy, F.L.S., has returned to his work in the Department after a tour covering eight months. For the first two months he acted as the representative of the Transvaal at the South African Exhibition, which was held in London last February, and it is well known that the success of the exhibition was in large measure due to the tireless efforts of the Government Agrostologist and Botanist. After the close of the exhibition Mr. Burtt-Davy crossed to Europe, and spent some time on the Continent. He visited the famous Horticultural School at Versailles and the National Institut Agronomique of Paris; thence he proceeded to Algiers, *via* Marseilles, in order to study the prevailing methods of cultivation in a land which is subject to long periods of drought similar to those which afflict the Transvaal. Mr. Burtt-Davy was much impressed with the way in which the French Government is developing agriculture and agricultural education in the Colony of Algiers. The main crops are wine, olives and wheat, while large numbers of sheep are bred for importation into France. He then went into the date and lucerne growing districts of the Sahara Desert, and studied the several systems of irrigation adopted there. At Tunis the Botanist paid special attention to the methods of teaching agriculture in the schools. Here every boy who goes through the agricultural school is taught practical carpentry, blacksmithing, and horseshoeing, along with his other studies in agricultural science. From Algiers Mr. Burtt-Davy returned to Marseilles and went eastward along the Riviera to see the culture of seeds at Antibes, where a large seed industry is established. He also visited the famous gardens of La Mortola, started and maintained by the late Sir Thomas Hanbury as a sort of sub-tropical Experiment Station for the growing of trees and other things. Then he journeyed to the district of Provence to investigate the culture of lucerne and was much struck with the intensive cultivation in the Midi, where 75 acres is looked upon as a large farm. Switzerland was the next objective. At Zurich the Botanist inspected the famous International Seed Control Station, and visited the renowned Polytechnic High School. Returning to Paris, he visited the well-known Experiment Station of Messrs. Vilmorin and Andrieux, at Verrieres.

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From France Mr. Burtt-Davy crossed over to England, and stayed for some time with Mr. Biffen, the eminent wheat breeder, and visited the Botanic Gardens of Oxford and Cambridge. While in London he read a paper on "Native Timber Trees" before the Linnæan Society, and lectured on the "Agricultural Possibilities of the Transvaal" before the Royal Colonial Institute. From Kew he passed over to the United States, and spent five weeks at Cornell with Professor L. H. Bailey, the Director of the College of Agriculture; and Professor Webber, the foremost plant breeder of America. Mr. Burtt-Davy was

much impressed with the enormous expansion of the Cornell College of Agriculture, and was struck with the hearty manner in which the farmers of New York are supporting their Agricultural College. A new building has just been completed, costing $300,000, and the income of the College and Experiment Station now amounts to some $200,000 per annum. A staff of 75 professors and instructors is maintained in this college alone, and it is estimated that 1,000 students will soon be passing through the agricultural courses of this institution each year. The College of Agriculture is one of eight different colleges now grouped under the University of Cornell.

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Washington, the Capital City, was the next stage. Here he met Professor Hays, the Assistant Secretary of Agriculture, formerly Professor of Agriculture in the University of Minnesota. Amongst other things Professor Hays mentioned that after years of careful investigation he had found in the State of Minnesota that it was possible to increase the yield and value of farm produce as much as 25 per cent. by careful breeding. The Federal Department of Agriculture at Washington is taking a keen interest in questions of agricultural education in the different States, for, although education is a State concern, and so not coming directly under the control of the Federal Government, the Department of Agriculture at Washington realises the necessity of affording assistance to the several States in the organisation of agricultural education. One of the most startling phases of the most recent advance in American agricultural science is the extraordinary emphasis which is now laid upon pure research along agricultural lines as the only true basis for further practical development. No plainer instance of this can be given than by reference to the latest munificent fund for the endowment of agricultural research. Not content with their present lavish subsidies to every Agricultural College in the Union, this hard-headed, practical people have just instituted the Adams Fund for the sole purpose of stimulating scientific investigation at every Agricultural Experiment Station in the United States, as well as in their Insular possessions. This means that the sum of $15,000 per annum has been set aside for some fifty odd stations, or a grand total of $750,000 yearly. For us, the significance of this movement lies in the fact that henceforth the agricultural supremacy of this nation, so singularly far-seeing, will be based upon the unheralded work of the most skilful scientific investigators. Before leaving the States Mr. Burtt-Davy visited the Maryland State Experiment Station to see the work which is being carried on there in the improvement of tobacco by breeding. In England he saw Messrs. Sutton and Sons, the famous seedsmen, who were anxious to know all about the Transvaal. In order to study the real needs of the farmer on the spot these enterprising English merchants have placed a representative of their firm in Johannesburg.

Of the many and varied aspects of agriculture which the Botanist touched upon in this world tour, that which probably impressed him more than anything else was the possibility of materially increasing, at no distant date, the average production of the mealie by systematic crossing and judicious selection. To secure a marked increase per morgen, and, at the same time, to shorten the season of growth are the problems to which special attention will be directed by his Division during the next few years. It is hardly necessary for us to emphasise the value of such an extended agricultural tour, which entirely absorbed a well-earned vacation ; but it may not be out of place to draw the attention of our Government to the advantage of placing upon the Departmental Estimates a generous sum for *Agricultural Exploration* in order that our farmers may be fully armed with the best methods and most recent implements of agricultural warfare ; as essential to the peace and prosperity of this Colony as modern weapons are to the armies of our Empire.

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Mosquito Nets and Screens as a Fever Preventive.

THE brilliant researches conducted by the London and Liverpool Schools of Tropical Medicine, during the past decade, have clearly demonstrated the value of mosquito nets and screens in the prevention of malaria ; and we are glad to call attention to the timely and practical paper in this issue by Dr. Arnold, of Pietersburg, on the proper use of mosquito nets. It was noticed, with much pleasure, during a recent visit to Lourenco Marques, that mosquito proof screens had been fitted in all the more important buildings, both public and private, in that town ; and their use is said to have reduced, to a very considerable extent, the number of cases of malarial fever. Residents inform us that it is now possible to sit on one's verandah during the evening hours of the summer months in comfort and absolute freedom from the irritating and injurious effects of the bites of these insects. It will be remembered that the late Mr. C. B. Simpson (Government Entomologist) more than three years ago urged the necessity of the erection of mosquito proof screens on the doors and windows of dwellings and offices, and the Central South African Railways were one of the first of the Government Departments to adopt their use on the Eastern sections of their line. Since then most of the buildings at the Government Experimental Stations in various parts of the country have been similarly fitted up, with very beneficial results. We need hardly point out the importance of this matter to residents in the low lying districts of the Transvaal. When the benefits to be derived from their use are better understood, these screen doors and windows will be as generally used in South Africa as they have been for some years past in the United States of America.

South African Products Exhibition, London.

As the local secretary has not been able to issue the general report on the Exhibition, owing to the whole of the papers having not yet come to hand, it is impossible to do much more, in this issue, than give a list of some of the awards made to Transvaal exhibitors. The Exhibition remained open in London from the 23rd February until the 16th March inclusive, during which time it was visited by 85,000 people, in addition to about 10,000 school children. To the latter special facilities were given for the inspection of the different products exhibited. Prizes were offered for the best essays on "The South African Colonies and their products," and Mr. Robert Russell (late Director of Education in Natal) kindly examined the papers submitted, which came from 28 schools in various parts of London. It is needless to state that some of the children's conceptions of the surroundings in which we live so far away from England were distinctly curious.

Several lectures on the characteristics of each Colony were given while the Exhibition was open. Most of our exhibits met with the approval of the judges. In all fifty-five awards were given, among them being the following :—

Wool.

Parker, Wood & Co., Carolina, bronze medal.
Wakkerstroom Agricultural Society (A. G. Robertson), diploma.
Wakkerstroom Agricultural Society (W. M. Struben), silver medal.
Wakkerstroom Agricultural Society (W. M. Struben), diploma.
Wakkerstroom Agricultural Society (W. M. Struben), diploma.
Wakkerstroom Agricultural Society (W. M. Struben), bronze medal.

Cereal Foods.

R. and J. Fleming, Johannesburg, diploma.

Lucerne Hay.

Irene Estate, silver medal.
C. J. Moody, Potchefstroom, bronze medal.
J. A. Neser, Klerksdorp, diploma.

Oat Hay.

P. A. Cronje, Klerksdorp, bronze medal.
N. J. Kampher, Klerksdorp, diploma.

Cotton.

F. C. Ferreira, Zoutpansberg, silver medal.
W. H. Cook, Zoutpansberg, bronze medal.
H. Sutton, Chunies Poort, diploma.
Swaziland Corporation, diploma.
Ralls Bros., White River, diploma.
Col. Steinacker, Bushbuck Ridge, diploma.

Mealies.

Vereeniging Estates, gold medal.
Irene Estate, silver medal.
A. H. Malan, Standerton, bronze medal.
C. Olen & Son, Potchefstroom, diploma.

Mealie Cobs.

F. T. Nicholson, Pretoria, bronze medal.

Wheat and Oats.

T. J. de Wet, Klerksdorp, silver medal.
Experimental Farm, Potchefstroom.

Barley.

J. G. Ras, De Kroon, bronze medal.

Kaffir Corn.

Vereeniging Estates, diploma.

Ground Nuts.

C. M. Quarry, Warmbaths, bronze medal.

Oils.

"Alpha" Oil Mills, Pretoria, silver medal.

Canned and Bottled Fruits, Jams and Jellies.

Mrs. T. Shepstone, Pietpotgietersrust, silver medal.
Mrs. Isaac van Alphen, Pretoria, bronze medal.
Mrs. G. Roth, Pretoria, bronze medal.

Wattle Bark.

Swaziland Corporation, silver medal.
J. B. Buchanan, Amsterdam, bronze medal.

Tweed made in Transvaal.

Miss Trichardt, Standerton, diploma.

Potatoes.

S. du Toit, Randfontein, bronze medal.

Preserved Fruit.

Mrs. de Sousa, Lydenburg, bronze medal.
W. Moorcroft Edwards, Krugersdorp, diploma.

Wine.

M. A. Zoccola, Johannesburg, bronze medal.

The exhibits of the Department of Agriculture were shown as such. Although many of them received awards, prizes were given to the public only.

The Transvaal Horticultural Society.

We have received, through the courtesy of Mr. A. Dowdle, the Hon. Secretary of the Transvaal Horticultural Society, P.O. Box 1084, Johannesburg, a catalogue of the forthcoming Spring Show, to be held at the Wanderers' Grounds, Johannesburg, on the 29th and 30th of November, 1907. This Society, which is worthy of every encouragement, is affiliated with the Royal Horticultural Society of Great Britain. Sir George Farrar is the President for the year 1907-8, and Mr. W. H. Williams, P.O. Box 1362, is the hon. treasurer. The prizes amount to over £220, and we trust that many of our readers will help to make this notable enterprise a marked success.

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Seed Potatoes.

There is considerable promise that the difficulty of securing good seed potatoes at a reasonable price during the months from October to December inclusive will be met by the grower in British East Africa. Mr. J. R. Wood, Njoro Farm, Njoro, British East Africa, informs us that he is prepared to supply "Early Rose" and "Abundance" seed potatoes, shipped in cases, up from September to end of November, at the following rates :—

10 ton lots, £8 10s. per ton c.i.f. Delagoa Bay or Durban.
5 ton lots, £9 per ton c.i.f. Delagoa Bay or Durban.
Less, £9 10s. per ton c.i.f. Delagoa Bay or Durban.

A small lot of these seed potatoes has been supplied to the Experimental Farm, Potchefstroom, and their appearance and condition leaves nothing to be desired.

* * * *

Low Country Farmers Association.

It is with pleasure that we learn of the formation of the "Low Country Farmers Association" in the Northern Transvaal. The Hon. Secretary is Mr. A. W. Gale, and we take this opportunity of wishing the members every success on the inauguration of their Society.

* * * *

Inter-Colonial Agricultural Union of South Africa.

The third Annual Conference of the Inter-Colonial Agricultural Union of South Africa will be held in the Town Hall, Pretoria, on Monday, September 30th. The Right Hon. General Louis Botha, Premier of the Transvaal, will open the Conference at 11 a.m., and delegates will be present from all the Colonies of South Africa. A comprehensive agenda paper has been issued, and we may be certain that the deliberations of the Agricultural Union of South Africa will materially advance the agricultural welfare of our South African Colonies. We append a list of office-bearers for the year 1906-7 :—

President.—C. G. Lee, Esq., Klipplaat Junction (Cape Colony).

Vice-Presidents.—The Presidents of each affiliated Union, together with the Hon. P. W. Michau, M.L.C. (Cape Colony), A. H. Malan (Transvaal), G. D. Alexander (Natal) and F. T. Nicholson (Pretoria).

Executive Committee.—Cape Colony: Messrs. O. E. G. Evans (Eastpoort, Bedford), P. R. Malleson (Orchard Siding), W. van der Byl (Koelenhof). Natal: Messrs. W. Craig (Dundee), C. H. Mitchell, C. E. Hancock (Ixopo). Transvaal: Messrs. T. Smuts (Ermelo), F. P. van der Venter (Pretoria), Hon. A. G. Robertson (Wakkerstroom); with the following Advisory Members: Messrs. W. J. Palmer (Bloemfontein, O.R.C.), H. Watkins-Pitchford (Pietermaritzburg), and F. B. Smith (Pretoria).

Secretary and Treasurer.—F. D. MacDermott, Department of Agriculture, Capetown, P.O. Box 3. Telegraphic address: Bulletin, Capetown.

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Plant Breeding at Warmbaths.

SEVERAL interesting experiments are in progress at the Government Citrus Orchard at Warmbaths, under the care of Mr. C. A. Simmonds, the Assistant Horticulturist. These experiments consist of hybridizing the different varieties of citrus fruits with a view to obtaining types specially adapted to the diverse climates and seasons of the Transvaal. For example, it is evident that with an early ripening, medium, and late variety of orange it would be possible to hold citrus fruits on the trees practically the whole year round, and so obtain higher prices during the off season on the London market. Furthermore, an effort is being made to eliminate the pits from some of our early and late oranges, also from some of the better mid-season types. Again, it may be possible to secure frost resistant varieties by crossing with hardy Japanese fruits. Attention is also being paid to the improvement of several local varieties. These are some of the many lines of research in progress at Warmbaths, which will, we are sure, be eagerly watched by the fruit growers in our orange belt, and receive at the same time the sympathetic and practical support of the Government. Plant breeding is slow and arduous work. Many hundreds of experiments may be made without much visible result; but a late ripening or frost resistant orange will much more than re-pay all the money that may have been spent by the State upon this most important branch of agriculture. Moreover, there is no reason why we should wait for plant breeders in other countries to produce new varieties when we can create new fruits ourselves. Besides, varieties raised in this Colony will usually prove far superior to imported ones. We have but to recall the history of that seedling sent out by the United States Department of Agriculture, the "Washington Navel," to fully recognise the importance of a single tree in building up the vast orange industry of Southern California in the short space of quarter of a century.

A Citrus Centre.

PLATES 12 and 13 are taken in the Citrus Orchards of Messrs. Piet and Carl Potgieter, Warmbaths. In view of the export trade which is being developed by the Horticulturist, Mr. R. A. Davis, we may expect to hear more in the near future of Warmbaths as a citrus centre. The soil and climate of this region are eminently adapted to citrus cultivation, as is clearly shown by the wonderful productivity of both young and old trees. But improvement is still needed in the methods of tillage and irrigation. Fortunately, the growers of this belt have the advantage of the Government Citrus Orchard, which is situated in their midst.

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Scale Insects.

SCALE insects are the worst enemies which the citrus growers in the Transvaal have to contend against, and as they are not yet well known by many of our farmers, we have pleasure in publishing three coloured plates in this issue which will doubtless help in the correct identification of these pests. Mr. Howard, the Entomologist, will contribute an article on the "Scale Insects of Citrus Trees in the Transvaal" for the January number of this "Journal."

* * * *

Asparagus.

PLATE 16 shows a fine bunch of Asparagus, grown by Mr. Thomas H. Dale, M.R.C.V.S., the Government Veterinary Surgeon at Potchefstroom. Asparagus is widely grown in the United States, England and France, and we see no reason why it should not become a profitable crop in the Transvaal. Any of our readers who wish further information may refer to Mr. Dale, or to Mr. Bester, the Assistant Horticulturist, Potchefstroom. An admirable little book on "Asparagus—Its Culture for Home Use and for Market," by F. M. Hexamer, has been published by the Orange Judd Company, New York.

* * * *

WE would like to call the kind attention of our readers to the following circular respecting the Hutcheon Memorial Fund :—

The Hutcheon Memorial Fund.

"Subscriptions are invited towards a fund for providing a memorial to the late Mr. Duncan Hutcheon, M.R.C.V.S., for many years Chief Veterinary Surgeon of Cape Colony, and latterly Director of Agriculture.

The following gentlemen have consented to act as a Committee :—The Hon. J. X. Merriman, the Hon. Sir John Frost, the Hon. Sir Pieter Faure, the Hon. A. J. Fuller, the Hon. Colonel Crewe, the Hon. C. W. H. Kohler, Colonel W. E.

Plate 15.

Pure-Bred Rambouillet Merinos.

Photographed by Alfred Cottard, Exporter of Pedigree Sheep, Le Havre, France.

Plate 16.

A Bunch of Asparagus.

Grown at Potchefstroom.

Stanford, C. G. Lee, Esq., W. H. Hockley, Esq., A. W. Guthrie, Esq., C. P. Perks, Esq., H. H. Hards, Esq., Mr. F. B. Smith, Director of Agriculture, Pretoria ; the Director of Agriculture, Bloemfontein ; the Secretary for Agriculture, Salisbury ; the Government Entomologist, Pietermaritzburg.

The Committee feel that the late Dr. Hutcheon's many friends throughout South Africa, particularly among the farming community, will be pleased to have an opportunity of expressing by this means their appreciation of his many valuable services to the country, and the esteem in which he was generally held by those who came in contact with him.

It is generally felt that the memorial could not take a more suitable form than the provision of an annuity to supplement the small pension to which his widow is entitled from the Civil Service Fund. Should sufficient funds be subscribed over and above the amount required for that purpose, the balance will be devoted to the provision of such other suitable public memorial as may be decided upon. Mr. A. A. Persse, Hon. Secretary and Treasurer, P.O. Box 1134, Cape Town, will be glad to receive subscriptions and furnish any further information."

AGRICULTURAL NOTICES.

I.—Veterinary Division.

BLUE TONGUE IN SHEEP.

Vaccine for the inoculation of sheep against this disease can now be obtained at a small charge, on application to any District Government Veterinary Surgeon. It will be necessary for farmers to purchase a syringe in order to carry out the inoculation, and the Government Veterinary Surgeon will inform applicants where these instruments can be obtained.

A. THEILER,
Government Veterinary Bacteriologist.

* * * *

It is hereby notified for general information that special arrangements have been made with the Central South African Railways for forwarding pathological specimens for examination in the Veterinary Bacteriological Laboratory, and all such specimens can now be sent carriage forward, if addressed to the Government Veterinary Bacteriologist, Pretoria Station, and distinctly labelled "Scientific Specimens for Examination." The Government Veterinary Bacteriologist is at all times glad to make examinations and to report on pathological specimens, but farmers and others sending such are earnestly requested to write full particulars of the animal from which the specimen has been taken and to post such in time to be delivered before the arrival of the specimen, or, in case of urgency, to telegraph. The importance of doing this is urged since occasionally, when not previously advised, specimens have arrived in too decomposed a condition for examination.

F. B. SMITH,
Director of Agriculture.

Offices of the Director of Agriculture,
1st October, 1907.

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SUMMARY OF DEPARTMENTAL INSTRUCTIONS FOR THE GUIDANCE OF STOCK INSPECTORS AT TRANSVAAL PORTS OF ENTRY.

(Animals will be inspected only between the hours of sunrise and sunset.)

No. 1.—Cattle.

No cattle will be admitted into the Transvaal by road or rail unless the owner has previously applied for and obtained a written permit from the Department of Agriculture, Pretoria. This permit must be presented to the Stock Inspector along with the animals at the Ports of Entry specified in the permit.

In making application for this permit the following particulars must be furnished:—Name of owner; locality from which the cattle come; purpose for which they are being introduced; number of animals to be introduced (if coming by rail: station at which they are to be trucked; station at which they are to be derailed); name of consignee and ultimate destination of the animals. These particulars are required for the information of the Advisory Committee of the Ward or District into which the cattle are to be introduced, by whom all permits have to be recommended before they are issued.

SLAUGHTER CATTLE will be branded at the Port of Entry with the brand

on the left side of the neck before proceeding to their destination if this has not been already done by the consignor before shipment.

No. 2.—Equines.

All persons introducing equines into the Transvaal must produce certificates for their animals signed by a qualified Veterinary Surgeon holding the Diploma of the Royal College of Veterinary Surgeons, England, stating that the animals are free from disease and that they have been tested with mallein and have reacted in a

normal manner. These certificates will be collected by the Stock Inspector at the Port of Entry. If any horse is presented for admission without a certificate it will either be tested with mallein by the Stock Inspector and allowed to enter after the Inspector is satisfied that the animal is free from disease, or it may be allowed to proceed to its destination and tested there, whichever course is most convenient for the Department.

Exceptions.

Equines which are engaged in to-and-fro movements across the border. Equines which have recently come from the Transvaal and are returning thither.

Racehorses in training will be allowed to proceed to their destination upon the owner giving an undertaking to report their arrival to the Government Veterinary Surgeon of the District, and to submit the imported animals to the mallein test if the Government Veterinary Surgeon considers this necessary. All other equines will be detained and tested unless the owner has previously made other arrangements with this Department.

No. 3.—Sheep.

Sheep are subject to examination at the Port of Entry and liable to detention if found affected with scab.

No. 4.—Pigs.

Permits for the introduction of pigs are not required.

No 5.—Dogs.

The importation of dogs from Rhodesia is prohibited. No restrictions are imposed on the importation of dogs from the Colonies other than Rhodesia.

C. E. GRAY,
Principal Veterinary Surgeon.

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WARNING TO IMPORTERS.

The attention of the Department has been directed to the fact that certain imported cattle brought into this country under certificates stating that they have been tested with Tuberculin before shipment and have passed the test satisfactorily, have been found to react as infected when re-tested by the Government Veterinary Staff shortly after arrival. For this reason it is suggested that importers of cattle should have such imported animals re-tested by a Government Veterinary Surgeon on arrival at their destination, and before they are allowed to mix with other stock. Should anyone wish to take this precaution the test will be applied free of charge upon application to the Government Veterinary Surgeon of the District to which the cattle are taken, at the earliest convenience of this Officer to whom the application is made.

F. B. SMITH,
Director of Agriculture.

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NOTICE.

It is hereby notified for general information that the Department has been advised by the Commissioner, Nairobi, British East Africa, that sheep and goats may now be imported from the South African Colonies into British East Africa if accompanied by a Veterinary Certificate certifying that the animals are in good health.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, October 1st, 1906.

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GOVERNMENT NOTICE No. 873 of 1907.

Swine Importation Regulations.

It is hereby notified for general information that His Excellency the Governor has been pleased to cancel the Regulations published under Government Notices Nos. 741 of 1903 and 676 of 1905, restricting the importation of swine from Cape Colony.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 1st August, 1907.

RABIES IN RHODESIA.

The Secretary for Agriculture writes as follows:—

The disease is increasing. The last outbreak in a previously non-infected area occurred at a farm in the Enterprise District, about 25 miles from Salisbury, on 25th ultimo. Within the past six months one European and two natives have died of hydrophobia. The nearest reported case to the Transvaal border during the past twelve months occurred near the township of Gwanda.

Steps are now being taken to have all dogs in the country registered, and it is hoped by this means to reduce the number of native owned dogs, which are regarded as the chief cause of the spread of the disease, and to trace the source of any outbreak, so that the number of dogs in the district of origin may, if necessary, be destroyed.

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GOVERNMENT NOTICE No. 1124 OF 1906.

His Excellency the Acting Lieutenant-Governor has been pleased to make the following additional Regulation for the prevention of disease amongst stock under the powers in him vested by Sub-Section (1) of Section *five* of the Diseases of Stock Ordinance, 1902.

By Command of His Excellency the Acting Lieutenant-Governor.

ADAM JAMESON,
Commissioner of Lands.

Office of the Commissioner of Lands,
Pretoria, 30th October, 1906.

REGULATION.

When any person shall be found removing or causing to be removed or to have removed or to have caused to be removed any cattle from an infected area to a place outside such area or from a place outside an infected area to a place within such area or from one place to another within an infected area without the permit or license for removal prescribed by any regulation for the time being in force or when any person shall refuse or fail to produce the license or permit to remove cattle required by any regulation for the time being in force then any Magistrate, Native Commissioner or Sub-Commissioner, Justice of the Peace, Police Officer or Constable or any Officer of the Department of Agriculture may seize and detain any cattle the subject of such removal and take the same to a place of isolation and shall thereupon report all the circumstances to the Commissioner of Lands, who may order any cattle seized and detained as aforesaid to be slaughtered or otherwise dealt with in manner prescribed by him.

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SPONZIEKTE OR QUARTER EVIL.

Vaccine for the prevention of this disease is now ready for issue at the Government Veterinary Bacteriological Laboratory, and can be obtained through the Government Veterinary Surgeons, who will give instruction in the method of vaccination, and through whom also the necessary instruments can be obtained. The price of the vaccine is 3d. per double dose.

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No. 48 Admn. 1907.]

PROCLAMATION

BY HIS EXCELLENCY THE GOVERNOR OF THE TRANSVAAL.

Under and by virtue of the powers in me vested by Regulation *one* of the General Stock Regulations published under Government Notice No. 834 of 1903 and made under Ordinance No. 17 of 1902 I do hereby proclaim and make known that Fourteen Streams shall cease to be a Proclaimed Port for Entry of Stock into this Colony and that Proclamation No. 70 Administration 1903 shall be and is hereby withdrawn.

And under and by virtue of the powers vested in me as aforesaid I do further declare proclaim and make known that Christiana shall be a Proclaimed Port for Entry of Stock into this Colony for the purposes of the said Ordinance and the Regulations aforesaid or any amendment of such Regulations.

GOD SAVE THE KING.

Given under my Hand and Seal this Twenty-fifth day of June One thousand Nine hundred and Seven.

SELBORNE,
Governor.

By Command of His Excellency the Governor in Council.

LOUIS BOTHA,
Minister of Agriculture.

No. 65 Admn. 1907.]

PROCLAMATION

By His Excellency the Governor of the Transvaal.

Under and by virtue of the powers in me vested by Regulation *one* of the General Stock Regulations published under Government Notice No. 834 of 1903 and made under Ordinance No. 17 of 1902 I do hereby proclaim and make known that Schoeman's Drift on the Vaal River south of Potchefstroom shall be a proclaimed port for the entry of stock into this Colony.

And under and by virtue of the powers vested in me as aforesaid I do further proclaim and make known that the said port of entry shall only be open for the examination of live stock on Monday and Thursday in each week from sunrise to sunset.

God Save the King.

Given under my Hand and the Public Seal at Pretoria this Fourteenth day of August One thousand Nine hundred and Seven.

SELBORNE,
Governor.

By Comandm of His Excellency the Governor in Council.

LOUIS BOTHA,
Minister of Agriculture.

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GOVERNMENT NOTICE No. 606 of 1907.

Stock Disease Regulations.

It is hereby notified for general information that His Excellency the Governor has been pleased to amend Regulation *thirty* of the General Stock Disease Regulations, published under Government Notice No. 834 of 1903, by the addition thereto of the following paragraph (*e*) :—

(*e*) on the directions of the Principal Veterinary Surgeon cause any stock affected with disease or suspected of being so infected to be moved to any other place or to be isolated or segregated in accordance with such directions.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 22nd May, 1907.

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GOVERNMENT NOTICE No. 613 of 1907.

It is hereby notified for general information that, on account of the prevalence of lung-sickness in the British Bechuanaland Protectorate, permits for the admission of cattle from the British Bechuanaland Protectorate into the Transvaal will only be issued upon application to the Director of Agriculture, Pretoria, and provided such application is accompanied by a certificate signed by a Government veterinary surgeon, British Bechuanaland Protectorate, setting forth that the cattle in respect of which such application for permit is made are healthy and that there has been no case of contagious disease for at least three months previous to the date of such certificate upon the property on which such cattle have been.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 28th May, 1907.

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GOVERNMENT NOTICE No. 746 of 1907.

His Excellency the Governor has been pleased to make the following Regulation in pursuance of the powers in him vested by Section *eight* of Ordinance No. 38 of 1904.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 4th July, 1907.

Regulations for Preventing the Spread of East Coast Fever.

(*Made under Ordinance No. 38 of 1904, Section* eight.)

Whenever East Coast Fever has broken out on any farm in a District of this Colony the Minister of Agriculture may, by notice under his hand, order that all cattle on such farm and on any neighbouring farm be branded with such distinctive brand as may have been allotted by the Resident Magistrate of such District under the provisions of Ordinance No. 15 of 1904 (The Great Stock Brands Ordinance, 1904).

GOVERNMENT NOTICE No. 980 OF 1907.

It is hereby notified for general information that the proclaimed Port for the Entry of Stock into this Colony, established at Mosymiani, District Wolmaransstad, under Proclamation No. 70 Admn., 1903, will in future only be open for the examination of live stock on Saturday in each week, from sunrise to sunset.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 3rd September, 1907.

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GOVERNMENT NOTICE No. 965 OF 1907.

It is hereby notified for general information that the proclaimed Port for the Entry of Stock into this Colony, established at Coal Mine Drift on the Vaal River, south of Klerksdorp, under Proclamation No. 70 Admn., 1903, will in future only be open for the examination of live stock on Thursday in each week from sunrise to sunset.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture.
Pretoria, 26th August, 1907.

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PORTS FOR ENTRY OF STOCK.

The following are the ports for entry of stock into this Colony from the neighbouring territories:—

Mafeking Road Border	Cape Colony.
Mosimyani	„
Christiana	„
Coal Mine Drift	Orange River Colony.
Vereeniging	„
Roberts' Drift	„
Volksrust	Natal
Komati Poort, through which stock not provided for under Clause 5, Government Notice No. 834 of 1903, will only be allowed to proceed by rail, to be examined at Machadodorp	Portuguese East Africa.

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AFRICAN COAST FEVER.

AMENDED PROCLAMATION OF THE CAPE COLONY.

By Proclamation No. 231 of July 22nd, 1904, the provisions of Proclamation No. 202 of June 29th, 1904, are amended as follows:—

Dogs and cats will be admitted with special permission of the Chief Veterinary Surgeon, or his authorised representative, provided they are accompanied by a certificate signed by the Principal Veterinary Surgeon of the Transvaal, or his authorised representative to the effect that they have not come from or passed through any portion of the Transvaal proclaimed or known to be infected with African Coast Fever.

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GOVERNMENT NOTICE No. 404 OF 1907.

It is hereby notified for public information that compensation will be paid for visibly healthy equines, which, when the Mallein test is applied to them by an authorised Officer of the Agricultural Department, re-act to such test, and are afterwards destroyed by order of the Principal Veterinary Surgeon in consequence of their having so re-acted.

Provided that :—

(*a*) Such re-acting equines were tested and found to re-act for the first time subsequent to 24th January, 1907, and have been destroyed by order of the Principal Veterinary Surgeon since that date.

(*b*) Such re-acting animals are not found amongst newly imported equines when these animals are tested by an authorised Officer of the Agricultural Department at a Proclaimed Port of Entry, or at the border of the Colony or on arrival at their destination.

(*c*) No compensation will be paid on a greater scale than two-thirds of the value of the animal destroyed, and in no case will a greater sum than £20 be paid for any animal destroyed as aforesaid. The value of any animal destroyed will be determined by the Principal Veterinary Surgeon or his authorised representative.

(*d*) Compensation will not be paid for any animals showing any clinical indication of glanders which are ordered to be destroyed by the Principal Veterinary Surgeon, or by any person acting on his instructions.

Government Notice No. 103 of 1907 is hereby withdrawn.

J. C. SMUTS,
Acting Minister of Agriculture.

Office of the Minister of Agriculture,
Pretoria, 5th April, 1907.

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GOVERNMENT NOTICE No. 435 OF 1907.

It is hereby notified for general information that, on account of the prevalence of Lung-sickness in the Cape Colony, permits for the admission of cattle from Cape Colony into the Transvaal will only be issued upon application to the Director of Agriculture, Pretoria, and provided such application is accompanied by a certificate, signed by a Government Veterinary Surgeon, Cape Colony, setting forth that the cattle in respect of which such application for permit is made, are healthy, and that there has been no case of Contagious disease for at least three months previous to the date of such certificate upon the property on which such cattle have been.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 13th April, 1907.

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GLANDERS AND FARCY.

WARNING TO THE PUBLIC.

A considerable number of outbreaks of Glanders having been reported to the Agricultural Department as having occurred in various districts of the Colony during the past few weeks, the public are warned against the purchase of equines from unknown travelling dealers or on auction sales, unless the animals put up for sale are sold with a written guarantee signed by the owner, certifying that they are free from any contagious disease, as there is no doubt that unscrupulous persons have lately been disposing of infected animals at prices which have tempted the public to purchase the same, and that the disease has subsequently appeared in the stables of purchasers to their loss and detriment.

It is further recommended that all newly purchased equines should be kept isolated and should be watered separately and apart from any other equines on the premises for a period of three weeks after purchase, and should they show any indications suspicious of Glanders, a report should be forwarded at once to the Government Veterinary Surgeon of the District.

The following description of the disease is appended for the information of the public, and special attention is called to Government Notice No. 103 of 1907, which appears underneath.

Glanders and Farcy.

These two names are applied to one and the same disease, which is due to a microbe—Bacillus Malleus. The disease is called Farcy when located on the limbs or body: Glanders when the principal symptoms are seen in the nostrils, submaxillary glands, and lungs.

The horse tribe is most commonly affected with Glanders. Man not infrequently gets the disease from the horse by inoculation through a wound. The dog, the cat, and wild carnivora may be infected. The ox is absolutely immune. Sheep, goats, and pigs are immune for all practical purposes.

A horse may be affected with Glanders and show no symptoms except slight unthriftiness. This is called occult Glanders, and can only be diagnosed by the mallein test.

In typical clinical cases there is a thick grey-coloured discharge from one or both nostrils. Ulcers and ulcerous patches are seen inside the nasal cavities and the glands under the jaw are enlarged and hard. The temperature may be raised, but in chronic cases it may be no higher than the normal. In severe and acute cases

the temperature is several degrees above normal and the animal shows distinct symptoms of respiratory disease. In Farcy one or more limbs become swollen. The lymph vessels stand out prominently on the inside of the limbs. The vessels give a cord-like feel to the hand, and small nodules appear along the course of the vessels. These nodules become ulcers which discharge a thick yellow fluid of oily appearance. The ulcers may heal and leave a scar, but they usually break out again. Farcy may also appear on the skin of the neck and body.

One sees the ulcers on the skin if Farcy has been present. Besides what one sees in the live animals, one may also find ulceration of the throat and air passages. The most constant changes are found in the lungs. In acute Glanders, small grey nodules about the size of a pin-head are seen all through the lung substance. In the chronic forms the nodules in the earlier stages appear as small grey patches with a red margin. Others are of pus-like consistence. The older nodules are hard and shot-like to the touch; some of them are gritty—calcification. The number of nodules in a lung varies from one or two to hundreds. The donkey suffers from an acute form of Glanders in which the lungs are inflamed over a large surface. The tissue is solid, and on section the surface of the lung has a greyish red colour.

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GOVERNMENT NOTICE No. 31 OF 1907.

Under and by virtue of the powers in him vested by section *four* of the Diseases of Stock Ordinance, 1902, His Excellency the Acting Lieutenant-Governor has been pleased to prohibit, until further notice, the importation of Cattle from the Colony of Natal into this Colony, with the exception of stock entering under permit from oversea and passing through Natal by rail direct; provided that notwithstanding such prohibition, slaughter cattle for which permits have at the date of this notice been issued under Regulation 8 of the Regulations published under Government Notice 1288 of 1906, shall be admitted subject to the terms of such regulations.

Government Notice No. 1287 of 1906 shall be and is hereby withdrawn.

By command of His Excellency the Acting Lieutenant-Governor.

ADAM JAMESON,
Commissioner of Lands.

Office of the Commissioner of Lands,
Pretoria, 9th January, 1907.

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GOVERNMENT NOTICE No. 32 OF 1907.

His Excellency the Acting Lieutenant-Governor has been pleased to repeal the regulations published under Government Notice 1288 of 1906, and to substitute the following therefor:—

1. Any person who shall import any cattle from the Colony of Natal into this Colony, save cattle entering under permit from oversea and passing through Natal by rail direct, shall be liable, on conviction, to a fine not exceeding £50, and, in default of payment, to imprisonment, with or without hard labour, for a period not exceeding six months.
2. Any cattle which may, after the date of the promulgation of these regulations, have come into this Colony from the Colony of Natal, save as is excepted in the preceding regulation, and save such slaughter cattle for which permits have at the date of this notice been issued, may be seized by any Resident Magistrate, Native Commissioner, Sub-Commissioner, Justice of the Peace, Police Officer, or Constable, and detained and taken to a place of isolation, and the person so seizing and detaining such cattle shall immediately report all the circumstances to the Commissioner of Lands, who may order any such cattle to be slaughtered or otherwise dealt with.

By Command of His Excellency the Acting Lieutenant-Governor.

ADAM JAMESON,
Commissioner of Lands.

Office of the Commissioner of Lands,
Pretoria, 9th January, 1907.

* * * *

MADAGASCAR CATTLE.

His Majesty's Consul at Antananarivo has notified His Excellency the High Commissioner that the Export Duty on bullocks from Madagascar has been reduced from twelve shillings to two shillings per head.

AN ORDINANCE (No. 3 OF 1906) TO IMPOSE A DUTY ON THE EXPORT OF ANGORA RAMS AND EWES.

Be it enacted by the Lieutenant-Governor of the Transvaal with the advice and consent of the Legislative Council thereof as follows:—

1. Upon every Angora ram or ewe exported from this Colony after the date of the taking effect of this Ordinance there shall be payable save as herein provided to the officer appointed to receive the same a duty of one hundred pounds; provided always that no such duty shall be payable on the export of any such ram or ewe to any Colony or Territory in South Africa as soon as the Lieutenant-Governor shall by proclamation declare that such Colony or Territory has by statute provided for the imposition of a duty on the export of Angora rams and ewes not less than the amount imposed by this Ordinance.

2. Every person who shall export from this Colony any Angora ram or ewe (save as in this Ordinance provided) without payment of the duty imposed thereby shall be liable on conviction in addition to the duty to a fine of not less than twenty-five pounds and not exceeding one hundred pounds for every such ram or ewe so exported and in default of payment to imprisonment with or without hard labour for a period of not less than one month and not exceeding six months unless such fine be sooner paid.

3. Courts of Resident Magistrates shall have special jurisdiction to impose any of the penalties provided by this Ordinance for a contravention hereof.

4. It shall be lawful for the Lieutenant-Governor from time to time to make regulations for carrying out the provisions of this Ordinance.

5. This Ordinance may be cited for all purposes as the Angora Export Duty Ordinance 1906.

Passed in Council the twenty-eighth day of June, One thousand Nine hundred and Six.

II.—Division of Chemistry.

INSTRUCTIONS FOR THE SAMPLING OF SOILS.

In taking soil for analysis, it is of the utmost importance that a truly representative sample be secured, otherwise the labour involved will, to a great extent, be wasted.

Much depends upon the particular object for which the analysis is to be made. If the soil of a farm or field is to be reported upon, and much difference exists in the soil from different parts, each variety of soil should be represented in the final sample by a quantity proportional to the aliquot portion of the whole area covered by that particular soil.

If great differences are known to exist in different parts of the farm or field, better knowledge of the nature of the soil will be obtained, of course, at the cost of greater labour in analysis, if the samples are kept separate.

The *depth* to which a sample is taken is also a matter of importance. In some cases a clear line of separation between the soil proper and the sub-soil is perceptible. This is often shown by difference in colour, the soil being richer in organic matter, and therefore darker than the sub-soil. Under such circumstances the sample of soil should be taken down to the line, and, if necessary, a sample of sub-soil should also be secured. When no distinction is perceptible, the sample should be taken to the depth of one foot.

METHODS OF TAKING SAMPLES.

There are many ways of taking samples of soil. The following, perhaps, will be found most convenient in this country:—

(1) Having selected a representative spot, the vegetation upon it is removed, and a hole is dug with a sharp spade to a depth rather greater than that of the soil proper, or, if no line of separation of soil from sub-soil is perceptible, to about 15 inches. One side of the hole is then trimmed with the spade so as to be smooth and vertical, the hole being cleaned out. A slice of uniform thickness, about 3 or 4 inches, is then removed by the spade down to the necessary depth. This slice is placed on a clean board or sack and mixed with similar slices, obtained in the same way from other parts of the field. Finally, all the samples are thoroughly mixed together with the trowel or the spade, the sticks, large stones, and roots removed, and a portion of six or seven pounds placed, with a label giving details, in a clean box and sent for analysis.

(2) Another, better but more laborious, method is to have wooden boxes, 6 inches square and 12 inches deep, to hold the samples. A large hole is dug with a spade at the selected spot, and a square upright block of soil is left in its centre. This is carefully trimmed with the spade until a box will just fit over it. The upper surface of the block of soil is freed from vegetation, the box inverted over it, and forced down. The spade is next slipped under, and the box with its contents removed, a label giving particulars of the soil put in, and the lid screwed on. In this way a sample of the soil (and often the sub-soil, *in situ*) is obtained, which can be examined in the laboratory.

WHAT TO DO WITH THE SAMPLES.

In all cases full details as to the exact locality, date of collection, depth, crops borne, previous manurial treatment, and other circumstances connected with the soil should be enclosed with the sample. These should be written in pencil, as ink is apt to become damp and run.

Samples should be sent by passenger rail, addressed to me at the Agricultural Chemical Laboratories, Pretorius Street, Pretoria, and advice of their despatch, together with details of the samples, should be sent by post to the same address.

While every effort will be made to deal with the samples as soon as possible, for a time, at least, some delay may be unavoidable, owing to the large accumulation of material awaiting analysis. *No attention will be paid to samples sent without the full details stated above.*

A list of charges for the analysis of soil and other products is published below, but in cases where it is considered that the results may be of sufficiently general interest, if published, no charge will be made.

HERBERT INGLE,
Chief, Division of Chemistry.

* * * *

SCHEDULE OF CHARGES FOR ANALYSIS MADE IN THE AGRICULTURAL LABORATORIES.

	£	s.	d.
1. Estimation of one constituent in a manure or feeding stuff ..	0	7	6
2. Estimation of two or three constituents in a manure or feeding stuff	0	15	0
3. Complete analysis and valuation of a manure or feeding stuff ..	1	0	0
4. Analysis of water—drainage or irrigation	1	5	0
5. Partial analysis of a soil to determine fertility and manurial needs	2	0	0
6. Complete analysis of a soil	3	0	0
7. Analysis of milk, cream, butter, or cheese	0	10	0
8. Milk—determination of fat and total solids	0	5	0
9. Milk—determination of fat only	0	2	6
10. Butter—determination of water and fat	0	5	0
11. Analysis of a vegetable product—hay, ensilage, roots, etc.	1	0	0

At present no charge will be made to *bona fide* farmers. The charges in the above schedule refer to products sent by manure merchants, milk dealers, or others interested in trade. Samples will only be accepted if assurance can be given that they are properly taken and truly representative of the bulk. The right of publishing the results of any analysis is reserved by the Department. Should the examination of any product furnish results which are deemed of sufficient general interest, the charges may be remitted.

Samples of any product likely to be of agricultural importance will gladly be received.

III.—Division of Botany.

INJURIOUS WEEDS.

Owing to the fact that of late several newly-introduced and injurious weeds have made their appearance in the Transvaal, farmers are earnestly requested to take careful notice of any new plants which have appeared on their farms and which seem to have a tendency to spread. When such are discovered, specimens of the plant bearing flowers and, if possible, fruit should be forwarded to the Government Botanist by whom they will be examined and reported upon. They should be forwarded in the same way as specimens of poisonous plants.

SEED SALES BY THE DEPARTMENT OF AGRICULTURE.

The Division of Botany has lately received a large number of requests to sell farm seeds in bulk, and farmers are requested to note that the only seeds which this Division is prepared to sell are Lucerne, in lots not exceeding 50 lbs. at 1s., and Teff seed, in quantities not exceeding 10 lbs., at the same price. As a rule, reliable seed of all the more common Transvaal crops can now be purchased from local seed merchants.

* * * *

SEED DISTRIBUTION.

A list of seeds available for farmers who are willing to conduct experiments in co-operation with the Division has been published as Bulletins No. 1 and 2, printed in Dutch and English, and may be obtained on application to the Government Printer. Terms on which the seeds will be issued are stated in the Bulletin, and application forms will be found within the cover. Notes are given as to the uses of the plants and as to how the seed should be treated.

* * * *

COCKLE-BURR.

On account of the dangerous character of this weed to wool and mohair growers, farmers on the Aapjes, Pienaars, and Crocodile Rivers are advised to keep a sharp look-out for its appearance, especially on the banks of the rivers, and to root out the plants before they go to seed. Any farmer who is in doubt as to the identity of Cockle-Burr can send specimens to the Botanist for identification.

* * * *

POISONOUS PLANTS.

The Division of Botany and Division of Veterinary Science are carrying on a series of joint investigations on the poisonous plants of the Colony, their effect on stock, and the remedies to be applied.

Last year we invited farmers to send specimens of poisonous plants for identification and are glad to be able to extend the invitation this year.

Any farmer who has poisonous plants on his farm, and would like information about them, may send samples to the Department for investigation. These samples will be identified and named, will be tested on animals kept for the purpose, the symptoms will be carefully diagnosed, and different remedies will be tested. A report of the results will be sent to the person furnishing the specimens.

For an effective test, samples of at least 5 lbs. of the material should be sent, but smaller samples will also be welcome for identification and preliminary report.

Through the courtesy of the Postmaster-General, specimens may be sent by post, free of charge, if fastened up as letters and addressed:—

O.H.M.S. Letter Post.
The Government Botanist,
Department of Agriculture,
P.O. Box 434,
Pretoria.

* * * *

CO-OPERATIVE EXPERIMENTS: COTTON.

Cotton Seed Donated by the British Cotton Growing Association.

The Department has received a large consignment of American Upland Cotton Seed from the British Cotton Growing Association. This seed will be distributed to any *bona fide* farmer who wishes to give the crop a trial, in sufficient quantity to sow one acre (209 x 208 English feet).

The amount of seed required will be as follows:—

For the Low Veld, sowing 4 x 3 feet, 3 lbs. of seed.
„ Middle Veld „ 4 x 1½ „ 5 to 6 lbs. of seed.
„ High Veld „ 4 x 1 „ 7 to 9 lbs. of seed.

(The thicker sowing is advisable at higher altitudes where the climate is rather cooler.)

The farmer is required to pay all carriage and transport charges from Pretoria to his farm (freight from America to Pretoria has been paid by the Association and the Department).

The farmer must sign and return the attached form of agreement either to the Government Botanist or to the Resident Magistrate.

This agreement is made necessary by the conditions under which the Association has supplied the seed. These conditions read "That all the cotton grown from this seed shall be shipped to the Association for sale, and if the experiment proves successful the cost of the seed shall be refunded to the Association, that other experiments may be conducted: . . . if the experiments are a failure they (the farmers) will be called upon to pay nothing; if successful, the Association will dispose of the cotton for their account, and deduct the cost from the proceeds."

The Association has agreed to supply the Department with two hand-gins, which we intend to loan out to each district. Application for the use of these gins should be made in due course to the Resident Magistrate.

A pamphlet entitled "Hints on the Cultivation and Harvesting of Cotton," has been issued by the British Cotton Growing Association; a few copies are still available, one of which will be sent to each farmer receiving seed, as long as the supply holds out.

For further information on Cotton Cultivation, etc., growers are referred to the articles and notes which have appeared in the "Transvaal Agricultural Journal" during the last 18 months, particularly the following:—

Cotton Growing in the Transvaal: "Agricultural Journal," No. 12, pp. 739-745. (July, 1905.)
Cotton as a Possible Crop for the Transvaal: No. 8, pp. 595-599. (July, 1904.)
How to Estimate the Yield of Cotton-lint per Acre: No. 9, p. 174.
Weight of a Bale of Cotton: No. 9, p. 174.
Transvaal Cotton; Reports from the Imperial Institute: No. 9, pp. 136-137; No. 11, pp. 554—556.
Cotton in South Africa: No. 9, pp. 130-131.
Transvaal Native Cottons: No. 9, p. 131 and pp. 136-137.
Cotton in the Low Veld of the Eastern Transvaal: No. 10, p. 316.
Zoutpansberg Cotton: No. 9, pp. 136-137; No. 11, p. 554.
Swaziland Cotton: No. 9, p. 137.
Cotton in the Marico and Rustenburg Districts: No. 12, pp. 863-864 and 842.
Cotton at Malelane: No. 13, October, 1905, pp. 152-155.

JOSEPH BURTT-DAVY,
Government Agrostologist and Botanist.

THE GOVERNMENT AGROSTOLOGIST AND BOTANIST,
TRANSVAAL DEPARTMENT OF AGRICULTURE,
P.O. Box 434,
PRETORIA.

CO-OPERATIVE EXPERIMENTS: COTTON.

SIR,

Please forward me by* ....
carriage forward, to ....Station, in
care of ...., Forwarding
Agents, ...lbs. of cotton seed.

I agree to furnish you with a full and accurate report, at the end of the season, as to the results of the experiments, on the forms to be supplied by you.

In the case of the experiment being successful, I also agree to ship the whole of my crop of cotton to the British Cotton Growing Association for sale, and I will allow the aforesaid Association to deduct the cost of the seed from the proceeds thereof.

Date ....

Sign here ....
Two ....
witnesses. ....
Full P.O. Address ....

* State whether the seed is to be sent by Passenger or Goods Train or by Parcels Post. If it is to be sent by Post, 8d. per lb. for postage should be enclosed with the application.

IV.—Division of Forestry.

TARIFF FOR POLES AND FIREWOOD FROM GROENKLOOF PLANTATION, PRETORIA.

It is notified for general information that the Groenkloof Plantation having been transferred to the Municipality, all applications and correspondence in connection therewith should be addressed to the Town Engineer, Pretoria, and not to the Department of Agriculture.

* * * *

PRICE LIST OF TREES AND SEEDS.

The price list of trees and seeds supplied by this Division, which was printed in full under "Department Notices" in the last number of the "Journal," has now been issued as a separate publication, and can be obtained free of charge, on application to the Conservator of Forests, or the Government Printer, Pretoria.

* * * *

NOTICE No. 542 OF 1906.

GRANTS-IN-AID OF TREE PLANTING.

It is hereby notified that the Government is prepared to contribute towards the expenses of Tree Planting, undertaken by Municipalities, Agricultural Societies, and other Public Bodies.

The conditions under which the grant will be made are:—

(1) There shall be submitted to the Director of Agriculture for approval, as soon as possible after the 1st of July in each year, a plan of the place or places or streets where it is intended to plant, a list of the kinds of trees to be planted, and also an outline of the methods to be employed in preparing the ground for the trees and for protecting them. The total number of trees to be planted and the total estimated cost should be stated.

(2) The completed work shall be inspected and compared with the approved working plan, and for any unauthorised departure from the plan submitted to be approved by the Director of Agriculture a deduction may be made from the expenditure account.

(3) Street trees shall not be planted on the pavement or furrow or be spaced nearer than 15 feet apart. They must be securely fenced.

(4) Different kinds of trees shall not be mixed.

(5) Plantations shall be protected against fire.

(6) A separate account shall be kept of all monies expended on tree planting, and shall always be open for Government inspection, and a statement of accounts signed by the Chairman and Secretary and countersigned by the local Magistrate shall be submitted to the Director of Agriculture not later than the 1st of June in each year, so that the grant may be paid before the end of the financial year (June 30th).

(7) On approval of the Director of Agriculture, or his Deputy, of the work undertaken, and of the accounts for the same, a sum (not exceeding £100 for any one body) equal to half the total expenditure incurred in tree planting shall be refunded to the Municipality, Agricultural Society, or other Public Body concerned.

(8) As the money available for this scheme is limited, applications will be dealt with in the order in which they are received, till the whole sum has been allotted.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Department of Agriculture,
Pretoria, September, 1906.

V.—Division of Entomology.

GOVERNMENT NOTICE No. 874 OF 1907.

APPOINTMENT OF ENTOMOLOGIST.

It is hereby notified for general information that His Excellency the Governor has been pleased to approve of the appointment of Mr. Charles Walter Howard as Entomologist to the Transvaal Department of Agriculture; such appointment to date from the 1st July, 1907.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 1st August, 1907.

VI.—Tobacco Division.

TOBACCO PLANT DISEASES.

A large number of letters and verbal inquiries have been received by the Tobacco Division in regard to diseases and insects injurious to tobacco plants. It is impossible to give any reliable advice as to remedies for different diseases and insect pests unless a specimen of the affected plant is forwarded to us, and our readers are, therefore, requested to furnish a portion of the affected plant when writing for advice in such matters. Most of the diseases and insect pests which attack tobacco plants in the Transvaal are easily controlled. Letters, but not parcels, may be sent free of charge if addressed as follows:—

O.H.M.S.
Mr. J. van LEENHOFF,
Government Tobacco Expert,
Department of Agriculture,
Pretoria.

VII.—Editorial Division.

AVAILABLE PUBLICATIONS.

The following publications, amongst which are included several recent additions, can be had, free of charge, on application to the Government Printer, Box 373, Pretoria :—

Transvaal Agricultural Journal, No. 3, Vol. I. (Published quarterly).
„ „ „ No. 4, Vol. I. „ „
„ „ „ No. 13, Vol. IV. „ „
„ „ „ No. 14, Vol. IV. „ „
„ „ „ No. 15, Vol. IV. „ „
„ „ „ No. 16, Vol. IV. „ „
„ „ „ No. 17, Vol. V. „ „

Division of Botany:—

Leaflet No. 1.—"Plants Poisonous to Stock."
„ No. 4.—"The Cockle-Burr" (English and Dutch).
Bulletin No. 1.—"The Conditions of Seed and Plant Distribution," 1906-7.
„ No. 2.—"The Conditions of Seed and Plant Distribution," 1907-8.
Circular No. 1.—"Poisonous Plants" (English and Dutch).

Division of Entomology:—

Leaflet No. 7.—"The Spraying of Locusts" (English and Dutch).
„ No. 3.—"White Ants."
„ No. 5.—"The Fowl Tick."
Bulletin No. 5.—"Cockchafers."
„ „ 10.—"Citrus Scales."

Division of Forestry:—

"Price List of Seeds and Trees" (English and Dutch).

Division of Horticulture:—

Bulletin No. 1.—"Some Information about Fruit Trees" (English and Dutch).
Leaflet No. 3.—"A Fruit Report" (English and Dutch).
„ No. 4.—"Diseases of Orange Trees" (Dutch and English).

Division of Tobacco :—

Leaflet No. 1.—"Notes for the Guidance of Farmers sending Tobacco Plants or Leaves for Examination."

Division of Publications:—

Bulletin No. 1.—"Burrweed or Boete Bosch."
„ No. 2.—"Some Diseases of the Horse."
„ No. 3.—"The Food of Plants."
„ No. 6.—"City and Town Milk Supply and the Care and Aeration of Milk" (English and Dutch).

Division of Veterinary Science:—

Bulletin No. 1.—"Measles in Swine and Cattle" (English and Dutch).
" No. 6.—"Contagious Abortion" (English and Dutch).
Leaflet No. 3.—"Rhodesian Tick Fever" (English and Dutch).
" No. 5.—"Glanders and Farcy."
" No. 6.—"Directions for Preparing Blood Smears." (Dutch.)

Miscellaneous:—

Agriculture within the Empire.
Bulletin No. 1.—Department of Irrigation and Water Supply: "The Design and Construction of Small Reservoirs for Irrigation and for Stock."
" No. 2.—Department of Irrigation and Water Supply: "The Design and Construction of Small Irrigation Canals."
" No. 3.—"The Brands Directory, 1906."
Annual Report of the Director of Agriculture for the year 1903-4.
" " " " " 1904-5.
" " " " " 1905-6.

* * * *

JOURNAL FILES.

In order that our numerous readers may not be disappointed by being unable to complete their files, we would earnestly request them to preserve all copies of the "Journal" if they propose to bind them at the close of the year. Owing to the expense incurred in publication, it has become necessary to limit the number of copies issued, and it often happens that we cannot supply back numbers, as they are out of print.

Indices for the "Agricultural Journal," Vol. I., Vol. II., Vol. III., Vol. IV. and V., can be had on application to the Department of Agriculture.

* * * *

JOURNAL DUPLICATES.

Any readers who possess and can spare duplicates of the "Agricultural Journal" would confer a great favour by returning them to the Department of Agriculture, as back numbers are now out of print, and applications are constantly being made by persons desirous of completing their sets.

* * * *

APPLICATIONS FOR THE "JOURNAL" AND NON-DELIVERY.

Applications to be placed on the Mailing List of the "Journal," as well as complaints as to non-delivery of the "Journal," should be addressed to the Government Printer, P.O. Box 373, Pretoria, and not to the Editor of the "Journal." It is particularly requested that changes of address should also be promptly notified to the Government Printer, in order to ensure prompt delivery to addressees and to avoid unnecessary correspondence.

"The Transvaal Agricultural Journal" is issued free to residents in the Transvaal only.

Persons residing in the other South African Colonies or Oversea may become subscribers by paying an annual subscription of 7s., post free, starting from July in each year; 2s. extra is required for postage oversea.

Subscriptions are payable strictly in advance, and should be made by bank draft, money order, bank notes, or coin. Cheques cannot be accepted in payment, unless initialled by the Bank authorities.

All correspondence must be addressed and payments made to the Government Printer, Box 373, Pretoria.

VIII.—Standerton Stud Farm.

GOVERNMENT STALLIONS FOR PUBLIC STUD.

Applications to hire stallions for next season should be made before July 15th on which date these applications will be considered.

As the number of stallions is limited, preference will be given to owners of the best class of mares.

TERMS.

Stallions will be leased to individuals, associations, or two or more breeders in conjunction, approved of by the Department.

The Lessee or Lessees to allow the farming public to send mares for service at a fixed fee, provided the list is not already full, the fees to be according to the following tariffs, viz.:—

Prices paid for hire of Stallion.	*Fee to be charged by Lessee not to exceed*
£25	30s.
£30	35s.
£40	45s.
£50	55s.
£60	65s.

The charge for the hire of the majority of the stallions will range from £25 to £35, but for a few exceptionally high-class animals somewhat higher rates will be made.

Payment for hire of stallions to be made in advance.

Not more than 40 mares to be served by a stallion without written permission.

Stallions will be delivered by the Department at the nearest railway station to the place where they are to stand at stud, and expense of railage will be borne by the Department. At the termination of the season the stallion will be taken over by the Manager of the Government Stud Farm, or his representative.

Stallions will not be allowed to run with mares unless by special arrangement.

Due care must be taken that stallions shall not serve mares suffering from any contagious diseases.

The Manager of the Stud Farm or his representative to have the right to inspect the stallions leased at any time.

In the event of a stallion dying during the period for which he has been leased, from any cause through which the lessee is to blame, the lessee will be liable for a sum equal to the price already paid for the hire of the same.

The lessee to be responsible for the good care and attention of the stallion and his equipment.

Should any of the foregoing rules not be complied with, the Department shall have the right to remove the stallion at once, and to take any action desirable for the recovery of damages, the lessee to forfeit the money paid for hire.

Applications must be addressed to the Manager, from whom any further information can be obtained.

F. B. SMITH,
Director of Agriculture.

A. McNAE,
Manager.

IX.—Experimental Farm, Potchefstroom.

SEEDS FOR DISPOSAL.

POTATOES.

Price 15s. per bag of 160 lbs. nett, f.o.r. Potchefstroom, subject to alteration without notice.

The following varieties, after having been tested on this farm, are recommended, and "seed" thereof will be ready for disposal. Early and medium early varieties, from July to September. Late varieties, from September to November.

Size of Tubers.—Medium large and seed size mixed.

Varieties.—First crop from imported seed, and dipped in Formalin solution to prevent "scab."

Very Early.	*Early.*
Snowdrop.	Early Rose.
Early Puritan.	Beauty of Hebron.
White Hebron.	Epicure.

Medium Early.	*Late.*	*Very Late.*
Sutton's Flourball.	Five Towers.	Scottish Triumph.
Red Skin Flourball.	Up-to-date.	Langworthy.
Sharpe's Express.	Diamond.	African Red.
British Queen.	Invincible.	

Note.—The very early varieties yield smaller crops than the others. Their value consists in their very early maturity.

SEED POTATOES FROM BRITISH EAST AFRICA.

There is considerable promise that the difficulty of securing good seed potatoes at a reasonable price during the months from October to December inclusive will be met by the growers in British East Africa. Mr. J. R. Wood, Njoro Farm, Njoro, British East Africa, informs us that he is prepared to supply "Early Rose" and "Abundance" seed potatoes, shipped in cases from September to end of November, at the following rates :—

Ten ton lots	£8 10s.	per ton, c.i.f. Delagoa Bay or Durban.
Five „	£9	„ „ „ „
Less	£9 10s.	„ „ „ „

A small lot of these seed potatoes has been supplied to us, and their appearance and condition leave nothing to be desired. This lot is being tested at the Experimental Farm, Potchefstroom, and the results of the experiment will be watched with interest.

MEALIES (MAIZE).

Price 20s. per 100 lbs., f.o.r. Potchefstroom.

The following varieties, after having been thoroughly tested on this farm, are recommended. The kind of climate and the district in which the mealies are planted is the chief factor which determines the varieties which are suitable for that district.

Applicants who are not acquainted with the characteristics of the different varieties are recommended to leave the selection to the undersigned, who will forward seed of those varieties which are likely to give the best results in the district in which they are to be planted.

Colour.	*Name of Variety.*	*Maturation.*
WHITE :—	Virginian Horsetooth.	Late.
	Hickory Horsetooth.	Late.
	Improved Early Horsetooth.	Medium late.
	Hickory King (8 and 10 rowed).	„
	Iowa Silver Mine.	Medium.
	White Cango.	„
	Wisconsin White Dent.	Medium early.
	Wood's Northern White Dent.	„
	Champion White Pearl.	„
	Thoroughbred White Flint.	Early.
YELLOW :—	Yellow Horsetooth.	Very late.
	Golden King.	Late.
	Yellow Hogan.	„
	Austen's Colossal Yellow Dent.	„
	Yellow Flint.	„
	King of the Earlies.	Medium early.
	Early Star Leaming.	„
	Eureka Field Corn.	„
	Drought Proof Yellow Dent.	„
	Hundred Day Bristol.	„
	Chester County Mammoth.	Early.
	Extra Early Huron Dent.	„
	Ninety Day.	„
PALE YELLOW :—	White Cap Dent.	„

The whole of the seed offered is shelled from carefully selected and hand-picked cobs, true to the type and character of each variety. The greatest care is taken to ensure uniformity in the seed by "topping" and "tailing" the cobs, and by hand-picking. Some varieties are inclined to be unstable in their characteristics, and in other cases the effects of cross-fertilisation may not be apparent.

These conditions have been reduced to a minimum, as far as care in the growth and selection of the seed will permit.

SORGHUM (SACCHARATUM).

Price 3d. per lb., f.o.r. Potchefstroom.

Recommended for ensilage. Sow 12 to 15 lbs. per acre.

Broom Corn.

Price 3d. per lb., f.o.r. Potchefstroom.

Recommended for growing material required for making brooms. Sow about 8 lbs. per acre.

Teff.

Price 1s. per lb. f.o.r. Potchefstroom.

An excellent quick-growing grass, very suitable for hay. Sow about 2 lbs. per acre.

Manna (Boer).

Price 6d. per lb., f.o.r. Potchefstroom.

A robust growing variety of good quality. Sow 10 lbs. per acre.

As it is desired to distribute these seeds as widely as possible, the quantity of each variety which can be sold to individual purchasers will depend upon the applications received. Applications should be sent as early as possible, and orders must be accompanied by postal order or cheque in favour of General Manager, Experimental Farm, Potchefstroom, from whom any further particulars may be obtained.

ALEX. HOLM,
General Manager.

STALLION FOR PUBLIC STUD.

The "Clydesdale" Stallion "Transagric," sire Royal Chief (10,876), dam Minnie (Vol. 28), by Baron's Pride (9,122), grand dam Brenda II. (12,871), by Macgregor (1,487), will stand at Stud at the Experimental Farm, Potchefstroom, at the service fee of £2 2s., payable at the time of service.

"Transagric" won the gold medal at the Johannesburg Show of the Witwatersrand Agricultural Society, 1907, for the best Clydesdale exhibited. He is a black horse, about 16 hands 1 inch, on strong and short limbs, and full of substance and quality. He is recommended for breeding horses for van or draught purposes.

Arrangements can be made with the General Manager, Experimental Farm, Potchefstroom, for mares to remain at the farm during the service season at reasonable charges for keep and attendance.

ALEX. HOLM,
General Manager.

ERMELO STUD SHEEP FARM.

Government Merino Rams for Public Stud.

A limited number of duly qualified Ewes will be accepted for service after the 1st of October.

The Rams available for service comprise:

1. Imported Tasmanian Rams (President Strain).
2. Pure Tasmanian Rams, bred on the Farm.
3. Rambouillet Rams, imported direct from France.

Service fees range from 5s. to 10s. per ewe. An Agistment Fee (feeding fee) of 6d. per sheep per week will also be charged. All sheep must be removed on receiving notice from the Manager. The right is also reserved to refuse unsuitable sheep. No responsibility is accepted by the Agricultural Department, but all reasonable care will be taken of Ewes while on the Government Farm. Applications should be addressed to the Manager, Stud Sheep Farm, Ermelo.

F. B. SMITH,
Director of Agriculture.

Office of Director, Pretoria,
1st October, 1907.

X.—Division of Brands.

GOVERNMENT NOTICE No. 935 of 1907.

It is hereby notified for general information that the following Brands have been duly allotted and registered under the Great Stock Brands Ordinance (Ordinance No. 15 of 1904) during the quarter ending 30th June, 1907.

F. B. SMITH,
Director of Agriculture.

Office of Director of Agriculture.
31st July, 1907.

No. of Brand.	Name of Owner.	Address.	District.	Brand.
587	Villiers, de, Jan Gabriel	Schaapkraal, District Harrismith, P.O. New Market, O.R.C.	Wakkerstroom	U1V
588	Daneel, Adrian Jacobus	P.O. Wakkerstroom	..	UD9
589	Potgieter, Nicolaas Johannes	Daspoort Estate, Erf No. 119, P.O. Pretoria	Pretoria	AP6
590	Stander, Gideon Stephanus	De Kroon 420, P.O. Britz	..	AS6
591	Younger, John	P.O. Box 131, Heidelberg	Heidelberg	H7Y
592	Murray, Arthur Edmond	Uitval 12, P.O. Zendelingsfontein	Wolmaransstad	V1M
593	Wolman, Jacob	Wildealskraal 147, P.O. Balfour	Heidelberg	HW5
594	Whipp, Thomas Hodgson	Prosit, P.O. Box 65, Boksburg	..	H0W
595	Rankin, John	Rhenosterpoort, P.O. Zwagershoek	Waterberg	WR4
596	Eloff (jun.), Philippus Arnoldus	Rhenosterfontein 544, P.O. Zwagershoek	..	WE3
597	Toit, du, Guillaume Johannes Izak	P.O. Klerksdorp	Potchefstroom	PG3
598	Bramley, Lionel	Elandsheuvel 376, P.O. Box 56, Klerksdorp	..	PB5
599	Berg, van den, Marthinus Wessel	Buffelsvlei 646, P.O. Palmietfontein, Klerksdorp	..	PB6
600	Coetzee, Andries Jacobus	P.O. Palmietfontein	..	PC8
601	Nell, Phillipus Rudolph	Buffelsvlei 646, P.O. Palmietfontein 280, *via* Klerksdorp	..	PN4
602	Wet, de, Theunis Jacobus	P.O. Palmietfontein, *via* Klerksdorp	..	PW1
603	Truter, Casparus Johannes	P.O. Box 27, Lydenburg	Lydenburg	Y1T
604	Mackie & Rawer (Mackie, Alexander Lawrence, and Rawer, James Alexander)	P.O. Box 32, Benoni	Witwatersrand	XM5
605	Bloom, John	32, Dam Street, Vogelfontein, P.O. Box 15, Boksburg	..	XB5
606	Tierney, George Vincent	Doornhoek 241, Box 23, Waterval Boven	Carolina	C1T
607	Muller, Johannes Christoffel	Doornbult 530, P.O. Balmoral	Middelburg	GM2
608	Moodie, Malcolm	Hartebeestfontein 398, P.O. Balmoral	..	GM1
609	Katz & Salmoi	Klipfontein, P.O. Box 9, Witbank	..	GK2
610	Veldman, Adam	Alwynspoort, P.O. Enzelsberg	Marico	MA2
611	Hyde, Samuel James	Uitkyk 106, P.O. Leeuwdoorns	Wolmaransstad	VH6
612	Campher, Nicolaas Jacobus (jun.), and Campher, Nicolaas Jacobus (sen.)	Palmietfontein 280, P.O. Palmietfontein, *via* Klerksdorp	Potchefstroom	PC6
613	Viljoen, Abraham Johannes; Viljoen, Johannes Christoffel; Viljoen, Gideon Pieterus	Palmietfontein 280, *via* Klerksdorp	..	P5V

No. of Brand.	Name of Owner.	Address.	District.	Brand.
614	Grobler, Izaak Hermanus	P.O. Palmietfontein, *via* Klerksdorp	Potchefstroom	PG6
615	Berg, van den, Herbert Cecil	P.O. Palmietfontein, *via* Klerksdorp	..	PB0
616	Kirstein, Susie Elizabeth	Buisfontein, Hartebeestfontein	..	P9K
617	Kirstein, Walter David	Buisfontein, Hartebeestfontein	..	P7K
618	Kirstein (Mrs.), Philip Isaac	Buisfontein, Hartebeestfontein	..	P5K
619	Kirstein, Johan David	Buisfontein, Hartebeestfontein	..	P3K
620	Kirstein, Carl Frederick	Buisfontein, Hartebeestfontein	..	PK9
621	Kirstein, Philip Petrus	Buisfontein, Hartebeestfontein	..	PK5
622	Morrison, Hugh Lindsay	Klerksdorp	..	PM2
623	Spuy, van der, Meld	Corner of Rivier and Smit Streets, Potchefstroom	..	P8S
624	Coetzee, Adrian Erasmus	Zoutpan 160, P.O. Bloemhof	Bloemhof	BA2
625	Glaeser, George William	Zeerust, c/o W. N. Glaeser, Zeerust	Marico	M2G
626	Mothuloe, Rebecca	Vleeschfontein, P.O. Gaberones	..	MR1
627	Tulleken, Lodewyk Philip van Hoogenhout	Sterkfontein, P.O. Box 215, Standerton	Standerton	ST1
628	Lange, de, Adriaan Dirk	Sterkfontein, P.O. de Langer's Drift	..	S1A
629	Rood, Andries Jan Bruyns	Leeuwfontein 97, Standerton	..	SR1
630	Bornman (jun.), Johan Christiaan	P.O. Wolmaransstad	Wolmaransstad	V0B
631	Hoven, van der, Fryhoff Herschaal	Honing Krantz 38, P.O. Balmoral	Middelburg	G3V
632	Duckworth, Samuel	Angelo Deep G. M. Co., Driefontein, Boksburg District	Witwatersrand	X D9
633	Sutherland, William	Verkyk, P.O. Volksrust	Wakkerstroom	US2
634	Keyter (Mrs.), Martha Francina	Farm Beginsel 234, Standerton	Standerton	S0K
635	Botha, Lourens Rasmus	Doornhoek 88, P.O. Handelton, *via* Schweizer Reneke	Bloemhof	B1B
636	Lovemore, Joseph Crowe	Kaffaria 206, P.O. Box 10, Christiana	..	B4L
637	Bester, Edward Philipps	Tweefontein 101, du Toit Street, P.O. Pretoria	Pretoria	AE5
638	Unwin, Horace Collins	C/o E. P. Bester, Tweefontein 101, du Toit Street, P.O. Pretoria	..	AU5
639	Pienaar, Charles Isaac	Brooklyn, P.O. Box 1209, Pretoria	..	A1X
640	Fourie, Lambertus Nicolaas	Private Bag, de Kroon 120, *via* Brits Station	..	A4F
641	Glas, Hermanus Johannes Hendrik	Broederstroom No. 163, c/o The S.A.C., Rietfontein West 280	..	AG3
642	Ellis, James Alfred	Hermannsdoorns, P.O. Zandrivierspoort	Waterberg	WE4
643	Turner, Samuel, and Donisthorpe, Anderson de Alma	Num-Num, P.O. Nylstroom	..	W1N
644	Panizza, Camillo	Potgietersrust	..	WP8
645	Nel, Nicolaas Johannes Albertus	Doornbult 530, P.O. Balmoral	Middelburg	GN1
646	Niekerk, van, Gerhardus Wilhelmus	Goedehoop 270, P.O. Vaalkrans	..	G1N
647	Kennard, Richard William	Corner of Kaiser and Tucker Streets, Jeppe Extension, Box 1642, Johannesburg	Johannesburg	JK1
648	Lownds, Ethel	White Hill farm, Barberton	Barberton	NE1
649	White, Maurice	P.O. Box 28, Zeerust	Marico	MW1
650	Senekal, Johannes Jacobus	Klipkop 227, P.O. Klipkop	Rustenburg	R2S
651	Mundt, Hermann Emanuel	Middelplaat 52, Box 62, Ermelo	Ermelo	E4M
652	Kaalfontein Pound	Kaalfontein	Krugersdorp	◊ K7
653	Swart, Petrus	Scheerpoort 360, S.A.C., Rietfontein West 280	Pretoria	AS8

No. of Brand.	Name of Owner.	Address.	District.	Brand.
654	Scrooby, Octavius Benjamin	Grootplaats 194, P.O. Rietfontein West 280	Pretoria	A5S
655	Smit, Carel Andries	Scheerpoort 260, P.O. Rietfontein West 280	,,	A6S
656	Riekert, Martinus Nicholas	Hartbeestpoort 498, P.O. Rietfontein West 280	,,	A4R
657	Brittain, Thomas	Vogelstruisfontein 138, P.O. Val	Standerton	S2H
658	Standerton Municipality	Standerton	..	S1M
659	Andrews, Alfred George	Boschhoek, P.O. Lydenburg	Lydenburg	YA2
660	Souza, de (jun.), Mariano Louis	P.O. Box 17, Lydenburg	..	YZ7
661	Kay, George	P.O. Nylstroom	Waterberg	WK5
662	Wilson, Archibald	Doornfontein, P.O. Box 47, Lichtenburg	Lichtenburg	L1W
663	Button & Wentzel (Button, James, and Wentzel, August William)	P.O. Waterval Boven	Carolina	CW1
664	Louw, John Tobias	P.O. Box 3827, Johannesburg	Krugersdorp	K1L
665	Steenkamp, Thomas Ignatius	Spitzkop 65, P.O. Ermelo	Ermelo	ET2
666	Turner, Leonard Counsel	Nooitgedacht, Potchefstroom, and P.O. Melville, Johannesburg	Potchefstroom	PT0
667	Toit, du, Andreas François Petrus	Roodepoort, Ward Valrivier, P.O. Potchefstroom	..	PD2
668	Aardt, van, Theunis Frederick	Driefontein 350, P.O. Doornboom	Zoutpansberg	ZA3
669	Aswegan, van, Jacobus Johannes Nicholas	Johnsons Rust, P.O. Naauwte	..	ZA4
670	Potgieter, Andries Hendrik	Palmietkuil, P.O. Klipdam	..	ZA5
671	de Blanche (Mrs.), Mary Ann	Koppieskraal, P.O. Dwars River	..	ZA7
672	Brown, William	P.O. Box 45, Pietersburg	..	ZB3
673	Brandt (Mrs.), Johanna	The Parsonage, P.O. Pietersburg	..	ZB4
674	Beer, de, Pieter Zacharias	Mooiplaats 1668, P.O. Dwars River	..	ZB5
675	Beer, de, Gert Johannes	Kleinwonder, P.O. Potgietersrust, Pienaars Nek Police Post	..	ZB6
676	Broederstroom Stud Farm, The Manager	Pypkop, P.O. Haenertsburg	..	ZB7
677	Briel, Adriaan Zacharias Albertus	Warmberg, P.O. Chunies Poort	..	ZB9
678	Bantjes, John Thomas	Middagzon 926, P.O. Doornboom	..	ZB0
679	Baldwin, Frederic Tylden	P.O. Box 129, Pietersburg	..	Z7B
680	Colwyn, Hermanus Arnoldus Jacobus	Zoekmakaar No. 189, P.O. Doornboom	,,	ZC2
681	Cloete, Jacobus Phillipus Bernard	Zoekmakaar No. 189, P.O. Doornboom	..	ZC5
682	Botha, Cornelius Johannes	Laaste Hoop, P.O. Pietersburg	..	ZC6
683	Preez, du, Daniel Jacobus	Weltevreden, Zand Riviers Poort 141, P.O. Dwars River	..	ZD1
684	Preez, du, Pieter Daniel Andries	Klipdam, P.O. Klipdam	..	ZD2
685	Duvenhage, Philip Carl	Damplaats, P.O. Pietersburg	..	ZD3
686	Plessis, du, Andries Stephanus	Pylkop 471, P.O. Malips Drift	..	ZD4
687	Erasmus, Andries Stephanus David	Smitsplaats, P.O. Pietersburg	,,	ZE1
688	Merwe, van der, Eliza Johannes Leendert	Palmietgat 2367, P.O. Pietersburg	,,	ZE2
689	Euslin, Joseph Martin Fry	Matiebaskraal, P.O. Private Bag, Pietersburg	..	ZE3
690	Fraser-Dawson, Charles	P.O. Thabina	..	Z1F
691	Bronkhorst, Hendrik Lambert Johannes	Palmietkuil, P.O. Pietersburg	,,	ZH2

No. of Brand.	Name of Owner.	Address.	District.	Brand.
692	Hamman, Jacobus Petrus	Tweefontein, P.O. Box 20, Pietersburg	Zoutpansberg	ZH3
693	Hattingh, Johannes Jurgens	Mamre 457, P.O. Buffels	..	ZH4
694	Haenert, Maurice	Wachteenbeetjebosch, P.O. Kalkbank	..	Z1H
695	Hemsworth, Harry Denton	P.O. Haenertsburg	..	Z2H
696	Jooste, Johannes Petrus	Kareebosch, P.O. Doornboom	..	ZJ3
697	Jones, Charles Frederick	Wallacedale, P.O. Louis Trichardt	..	ZJ4
698	Jansen, Cornelis Alwyn Johannes, and Jansen, Willem Schalk Jacobus	Morgenzon, P.O. Chunies Poort; Rustplaats, P.O. Chunies Poort	..	ZJ5
699	Israelson, Max, and Israelson, Wolf	Cyferkuil 342, P.O. Box 53, Pietersburg	..	ZJ0
700	Bezuidenhout, Johannes Jacobus	Kareebosch, P.O. Pietersburg	..	Z2J
701	Knoop, George	Drieangle, P.O. Pietersburg	..	ZK1
702	Kemp, Hendrik	Lots Gronden, Malips River, P.O. Malips Drift	..	ZK2
703	Lith, van der, Christian Johannes	Wagendrift 1655, P.O. Buffels	..	Z4L
704	Ludwig, Herman August John, and Ludwig, John King	Ramagoeps Location, P.O. Dwars River	..	Z0L
705	Mollett, John Austen	Middagzon 926, P.O. Doornboom	..	ZM4
706	Matthews, Arthur Edgar	Education Department, P.O. Pietersburg	..	ZM5
707	Ogilvie, M.	Cross Hill, P.O. Pietersburg	..	ZM8
708	McKechnie, Andrew	Kalkfontein 146, P.O. Pietersburg	..	ZM9
709	Mare (sen.), Ignatius Johannes	Marabastad, P.O. Pietersburg	..	Z2M
710	Mavor, James Roderick	Slaapkoppieshoek 1958, P.O. Duivelskloof	..	Z3M
711	McLeod, George Ernest	Wilgeboschfontein, P.O. Louis Trichardt	..	Z4M
712	Niekerk, van, Willem Jacobus	Driefontein 358, P.O. Spelonken	..	ZN2
713	Naumann, Heinrich	Kalkgat, P.O. Kalkbank	..	ZN3
714	Nel, Petrus Jacobus	Micklenburg, P.O. Pietersburg	..	ZN4
715	Nieman, Hermanus Phillipus	Lots Gronden 248, P.O. Malipsdrift	..	ZN5
716	Pauer, Michael Ludwig	Sweet Home, P.O. Naauwte	..	ZP3
717	Jager, de, Pieter Hendrik Carel	Uitkyk, P.O. Pietersburg	..	ZP4
718	Degenaar, Phillippus Johannes	Lamoelaslaagte, P.O. Kalkbank	..	ZP6
719	Pahl, August Wilhelm Karl Frederick	Kalkbank 128, P.O. Kalkbank	..	ZP7
720	Potgieter, Willem Jan Hendrik	Rietvlei, Groot Spelonken, P.O. Doornboom	..	ZP8
721	Potgieter, Johannes Stephanus	Groot Dorst, P.O. Naauwte	..	ZP9
722	Oelofse, Phillip Christian	Kalkfontein, P.O. Klipdam	..	ZP0
723	Preez, du, Johannes George	Grootfontein, P.O. Malipsdrift	..	Z3P
724	Grobler, Pieter	Rietpol, P.O. Klipdam	..	Z7P
725	Ruhs, Carl Albrecht	P.O. Box 38, Pietersburg	..	ZR1
726	Rensburg, van (sen.), Hendrik Christoffel Janse; Rensburg, van (Jun.), Hendrik Christoffel Janse; and Rensburg, van, Petrus Johannes Jacobus Janse	Boschfontein, P.O. Pietersburg; Doornfontein, P.O. Pietersburg; Boschfontein, P.O. Pietersburg	..	ZR2
727	Rowles, Frederick William	Benjamin 909, P.O. Pietersburg	..	ZR3
728	Richter, Otto	Zaagkuil 125, P.O. Woodbush	..	ZR4
729	Roux, le, Gabriel Petrus	P.O. Box 187, Pietersburg	..	ZR7
730	Rawe, James	Doornboom 1579, P.O. Doornboom, Groot Spelonken	..	ZR0

No. of Brand.	Name of Owner.	Address.	District.	Brand.
731	Schleuker, Alwin Emanuel	Baskopje 669, P.O. Box 175, Pietersburg	Zoutpansberg	Z83
732	Staden, van, Marthinus Jacobus	Doorn River P.O. Pietersburg	"	Z84
733	Swart, Hermanus Carel	Sannapoort, P.O. Dwars River	..	Z85
734	Steyn, Jan Hendrik	de Beers, c/o S.A.C., P.O. Chunies Poort	"	Z86
735	Smit (jun.), Erasmus Johannes	Kleinwonder, c/o S.A.C., P.O. Potgietersrust	..	Z88
736	Smit (sen.), Erasmus Johannes	Kleinwonder, c/o S.A.C., P.O. Potgietersrust	..	Z38
737	Scheepers, Hendrik Nicholas	Pylkop 471, P.O. Malipsdrift	..	Z58
738	Trollope, Johanna Maria	Klipkoppies, P.O. Naauwte	..	ZT2
739	Unkles, Albert Palmer	Naauwte, P.O. Naauwte	..	ZU1
740	Visagie, Cornelis Johannes	Stanfontein, P.O. Pietersburg	..	ZV3
741	Venter, Petrus Albertus	Lonsdale, P.O. Zandfontein	..	ZV5
742	Vereneil, Jan Jacobus Andries	Kareebosch, P.O. Klipdam	..	ZV6
743	Waveren, van, John Willem	Damplaats, P.O. Pietersburg	..	ZV8
744	Vogel, Phillip Lodewyk	Grootfontein, P.O. Malipsdrift	..	ZV9
745	Vogel, Gert Cornelius	Katkloof, P.O. Malipsdrift	..	ZV0
746	Verreyne, Thomas Jacobus	Lots Gronden 118, P.O. Malipsdrift	..	Z3V
747	Venter, Jacobus Daniel	Zevenfontein 829, P.O. Dwars River	..	Z4V
748	Chamberlain, Charles	P.O. Box 138, Pietersburg	..	Z0V
749	Wienand, Robert Hildewig, and Wienand, Austin Welsh	Laasteboop 886, P.O. Smitsdrift	..	ZW1
750	Watt, William	Cross Hill, P.O. Kalkbank	..	ZW2
751	Jacobs, Willem Jacobus	Geluk 453, P.O. Pietersburg	..	ZW3
752	Wentzel, Benjamin	Driehoek 2014, P.O. Duivelskloof	..	ZW4
753	Wolf, Jacobus Johannes Frederick, and Simpson, Percy Edward	P.O Box 87, Pietersburg	..	ZW7
754	Potgieter, Jacobus Lawrence	Belfast	Lydenburg	YJ7
755	Coetzee, Stephanus Hermanus	Hartebeestspruit, Belfast	..	Y18
756	Grobler, Jacob Phillipus Petrus	Goedehoop, Belfast	..	YG1
757	Mare (P.'sson), Phillipus Petrus	Waterval, P.O. Machadodorp	..	YP2

BRANDS SURRENDERED AND CANCELLED IN TERMS OF SECTION 13 OF THE GREAT STOCK BRANDS ORDINANCE OF 1904.

Brand No.	Name of Owner.	Address.	District.	Brand Allotted.
119	Daspoort Pound	Hermanstad	Pretoria	◊ A5

XI.—General Notices.

LIST OF FARMERS' ASSOCIATIONS AND AGRICULTURAL SOCIETIES IN THE TRANSVAAL.

Aapjes River Ward Agricultural Society, A. F. von Gass, Pyramid Station.
Aapjes River Ward Farmers' Association, F. Carlisle, Pyramid Station.
Barberton Farmers' Association, Geo. E. O. Wilhelm, Box 157, Barberton.
Barberton Agricultural Society, J. S. Dyce, Box 5, Barberton.
Barberton and District Farmers' Association, G. E. O. Wilhelm, Secretary and Treasurer, Box 157, Barberton.
Bloemhof Agricultural Society, W. L. Dagg, Bloemhof.
Carolina Agricultural Society, M. van Enter, Box 43, Carolina.
Christiana Agricultural Society, Secretary, Christiana.
Crocodile River Farmers' Association, F. J. van Deventer, Box 751, Pretoria.
Eastern Transvaal Farmers' Association, T. W. Snaith, Box 75, Springs.
Ermelo Agricultural Society, A. Smuts, Box 5, Ermelo.
Elands River Farmers' Association, E. H. Eloff, Rietvlei, Lindley's Poort, Rustenburg.
Haenertsburg Farmers' Association, Haenertsburg, *via* Pietersburg.
Heidelberg Agricultural Society, W. Harvey, Box 36, Heidelberg.
Hekpoort Farmers' Association, Secretary, *via* Krugersdorp.
Hex River Farmers' Association, W. Breedt, Hex River, Rustenburg.
Highveld Farmers' Association, F. Findley, Ceylon, *via* Krugersdorp.
Highveld Farmers' Association, W. Robinson, Rustenburg.
Klerksdorp Agricultural Society, H. Bramley, Box 56, Klerksdorp.
Klip River Farmers' Association, Krugersdorp.
Koesterfontein Farmers' Association, Secretary, *via* Krugersdorp.
Krugersdorp Farmers' Association, G. Figulus, Box 188, Krugersdorp.
Krugersdorp Agricultural Society, H. A. von Blommestein, Box 368, Krugersdorp.
Lydenburg Agricultural Society, S. Hiemstra, Box 69, Lydenburg.
Lydenburg Farmers' Association, E. de Souza, Lydenburg.
Leuwdoorns Farmers' Association, W. Sterling Hamilton, Syfergat, Leuwdoorns, *via* Klerksdorp.
Low Country Farmers' Association, A. W. Gale, Middelhand, P. O. Devilskloof, Zoutpansberg, N. Transvaal.
Marico Agricultural Society, J. L. van Heerden, Box 82, Zeerust.
Middelburg Agricultural Society, J. W. Henwood, Box 229, Middelburg.
New Scotland Farmers' Association, H. S. Parry, Grasdal, Lake Chrissie.
New Agatha Farmers' Association, Henry W. Molyneux, New Agatha, *via* Pietersburg.
Pietersburg Agricultural Society, J. W. Johnson, Box 32, Pietersburg.
Pietersburg Farmers' Association, G. G. Munnik, Pietersburg.
Pietersburg Poultry Club, H. Moore, Box 103, Pietersburg.
Piet Retief Farmers' Association, K. P. van Dijk, Box 18, Piet Retief.
Pisanghoek Farmers' Association, W. J. Brickhill, Diana, *via* Pietersburg.
Platrand Farmers' Association, A. H. Barron, Platrand.
Potchefstroom Agricultural Society, Secretary, Box 70, Potchefstroom.
Potgietersrust Fruitgrowers' and Planters' Association, H. J. Ströbel.
Pretoria Agricultural Society, H. Cornforth, Box 685, Pretoria.
Rand Poultry Club, F. H. Stoll, Box 2712, Johannesburg.
Rustenburg Farmers' Association, Leo Machel, Rustenburg.
Settlers' Association, Hon. H. Wyndham, Kroomdraai.
Southern Waterberg Farmers' Association, C. M. Quarry, P.O. Warmbaths.
Standerton Agricultural Society, F. C. de Witt, Box 158, Standerton.
Transvaal Agricultural Union, F. T. Nicholson, Box 134, Pretoria.
Transvaal Farmers' Association, E. W. Hunt, Box 3785, Johannesburg.
Transvaal Land Owners' Association, H. A. Baily, Box 1281, Johannesburg.
Transvaal Poultry Club, J. F. Hilson, Box 1129, Pretoria.
Transvaal Stockbreeders' Association, F. T. Nicholson, Box 134, Pretoria.
Transvaal Tobacco Growers' Association, Capt. Madge, Secretary, Box 4303, Johannesburg.
Vaal River Farmers' Association, J. van Zijl, *via* Potchefstroom.
Waterberg Agricultural Society, I. von Backstroom, Box 7, Nylstroom.
Wakkerstroom Agricultural Society, G. Maasdorp, Volksrust.
Witfontein Farmers' Association, J. Krugel, *via* Krugersdorp.
Witwatersrand Farmers' Association, H. J. A. Wentworth, P.O. Craighall, near Johannesburg.
Witwatersrand Dairy Farmers' Association, H. Clarke, Box 5908, Johannesburg.

Witwatersrand Agricultural Society, W. H. Poultney, Box 4344, Johannesburg.
White River Farmers' Association, Archibald T. Ralls, White River, *via* Nelspruit.
Wolmaransstad Farmers' Association, F. W. Konig, Box 1, Wolmaransstad.
Wonderfontein Farmers' Association, Secretary, *via* Krugersdorp.
Woodbush Farmers' Association, Secretary and Treasurer, Percy Kent, Spitskop, P.O. Haenertsburg.
Zwartkop Farmers' Association, M. Vorster, Zwartkop, *via* Krugersdorp.
Zwartruggens Farmers' and Planters' Association, G. R. Wedderburn, J.P., Broadwood Vale, P.O. Kosterfontein, Rustenburg.

OTHER COLONIES.

Agricultural Union of Cape Colony, D. M. Brown, Box 187, Port Elizabeth.
Bloemfontein and O.R.C. Agricultural Society, J. Fraser, Box 250, Bloemfontein.
Cape Central Farmers' Association, H. C. Hall, Bedford, Cape Colony.
Cape Stud Breeders' Association, J. Pike, Box 703, Capetown.
Natal Agricultural Union, D. M. Eadie, Timber Street, Pietermaritzburg.
Orange River Colony Central Farmers' Association, W. B. Fowler, Secretary, Hill's Buildings, Maitland Street, Bloemfontein.
Orange River Colony Stockbreeders' Association, Secretary, Bloemfontein.
Rhodesian Agricultural Union, Secretary, Box 135, Salisbury, Rhodesia.
South African Co-operative Union, A. C. Lyell, Box 574, Bloemfontein, O.R.C.
Upper Klip River Farmers' Association, Secretary, Vrede District, O.R.C.

LIST OF OFFICIALS.

The following is a list of the officials of the Transvaal Department of Agriculture, to whom inquiries respecting matters connected with agriculture may be addressed:—

Director	F. B. Smith.
Division of Veterinary Science:	
(*a*) Bacteriology	A. Theiler.
(*b*) Contagious Diseases	C. E. Gray.
Division of Chemistry	Herbert Ingle.
Division of Botany	J. Burtt-Davy.
(*a*) Plant Pathology	I. P. Pole-Evans.
(*b*) Seed Introduction and Plant Experiments	H. G. Mundy.
Division of Forestry	Charles E. Legat.
Division of Entomology	C. W. Howard.
Division of Horticulture	R. A. Davis.
Division of Tobacco	J. van Leenhoff.
Division of Publications	William Macdonald.
Division of Poultry	Reginald Bourlay.
Government Stud Farm, Standerton	A. McNae
Government Stud Sheep Farm, Ermelo	V. Bossley.
Government Experimental Farm, Ermelo	H. Nicholson.
Government Experimental Farm, Potchefstroom	Alexander Holm.
Government Experimental Farm, Tzaneen	H. S. Altenroxel.
Translator	Otto Menzel.
Registrar of Brands	J. J. Pienaar.
Librarian	S. W. Wagstaff.

ADDRESS.

Correspondents are earnestly requested to give their full name and correct postal address when forwarding any communication to the Department. It sometimes happens that readers send their farm address only, and fail to give the Post Office address, consequently it is impossible to reply to their queries or send publications. This refers more especially to farmers applying for cattle permits, as in many cases letters forwarded by the Veterinary Division are returned by the Postal Authorities to the effect "Not delivered. Address insufficient." The Department should also be immediately notified of any change of address.

GOVERNMENT NOTICE No. 242 OF 1906.

GRANTS-IN-AID OF AGRICULTURAL SOCIETIES AND OTHER SIMILAR ORGANISATIONS.

Notice is hereby given that for the purpose of assisting Agricultural Societies and other organisations formed for the promotion of the agricultural industry, the Government will be prepared to make grants-in-aid to such societies on the following conditions:—

1. Ten shillings for every £ raised by subscriptions, donations, and gate money, the proceeds of which are devoted to the ends specified above. No grants to be made against "value" contributions.

2. Special grants, when funds are available, against the costs actually and *bona fide* incurred in the future construction of buildings on, or other permanent improvements to, agricultural societies' grounds, provided that such buildings or improvements remain unalienated and vested in the Chairman or Secretary as trustee of the subscribers.

3. The Registrar of Deeds will be notified of all grants made under Clause 2, and will register same against the transfer of the property concerned.

4. The grants will be subject to the approval of the Commissioner of Lands, who will deal with the applications as they are received, fixing a maximum sum to be granted, if he deem necessary, having regard to the funds at his disposal, and the needs of the society concerned.

5. The Commissioner of Lands may alter the conditions under which any grant is made when, in his opinion, it is desirable to do so.

6. Grants will be paid annually on production of a statement of receipts and expenditure signed by the Chairman of the society or club, and bearing a certificate as follows:—

> "I hereby declare the above to be a true and faithful statement of the receipts and expenditure of the ....during the period from ....to................and that no grant has already been claimed from the Government in respect of any portion of the receipts here shown."

Such declaration to be made before the local Magistrate or Resident Justice of the Peace, and who will also declare as follows:—

> "I certify that to the best of my knowledge and belief the above statement is correct and that the society is entitled to a grant from Government under the conditions laid down in Government Notice No. 242 of 1906."

7. Claims intended for payment before the end of each financial year should be submitted not later than the 30th April.

They must be in respect of subscriptions and donations, etc., received during the twelve months ending on the 31st March of each year, and not prior to the commencement of that period, unless no claim has been made in the previous year.

8. Applications for grants should in all cases be forwarded through the local Resident Magistrate or Resident Justice of the Peace.

9. Copies of the audited balance sheet and the annual report of the society or club should be forwarded to the Department of Agriculture as soon as published.

Office of the Director of Agriculture,
Pretoria, 5th March, 1906.

SOUTH AFRICAN STUD BOOK.

A record of all classes of stock, the object being to encourage the breeding of thoroughbred stock and to maintain the purity of breeds, thus enhancing their value to the individual owner and to the country generally.

Application for membership and entries of stock should be addressed to—

For Cape Colony—J. Pike, P.O. Box 703, Capetown.
For Transvaal—F. T. Nicholson, P.O. Box 134, Pretoria.
For Orange River Colony—E. J. MacMillan, Government Buildings, Bloemfontein.

The South African Stud Book, Volume I., is obtainable from T. Maskew Miller, Adderley Street, Capetown. Price, 10s. 6d.

J. PIKE, *Secretary.*
South African Stud Book Association.

DEPARTMENT OF IRRIGATION.

Advice to Farmers.

It is hereby notified for general information that the Irrigation Department is prepared to give advice to farmers on any farm relative to irrigation problems, in accordance with regulations approved by the Hon. the Minister for Lands.

Farmers are expected to facilitate the transport of the Irrigation Officials from farm to farm wherever possible.

Application should be made by letter to the Chief Engineer, Irrigation, or to the Resident Magistrate of the District.

F. A. HURLEY,
Chief Engineer, Irrigation.

* * * *

IRRIGATION AND WATER SUPPLY DEPARTMENT.

Regulations and Conditions for the Hire of a Government Water Drill for Boring for Water.

1.—*Submission of Applications.*

Applications by farmers for the hire of a Government Water Drill for boring for water should be sent on form $\frac{\text{I. D.}}{\text{B.}}$ No. 49 (Revised), to the Boring Engineer, Irrigation Department, P.O. Box 557, Pretoria, through the Resident Magistrate of the district in which the applicant resides.

2.—*Acceptance of Applications.*

This is subject to such enquiry by the Resident Magistrate and Boring Engineer as may be deemed necessary for ascertaining the following particulars:—

(*a*) Geographical and geological practicability of the proposed bore.
(*b*) Ability of applicant to pay all charges.
(*c*) Necessity for water (1) for domestic purposes, (2) for stock, (3) for irrigation.
(*d*) Proximity to other proposed bores.

Special regard will be given to the development of Farming and Agricultural Industries.

3.—*Notification of Acceptance of Application.*

The acceptance of his application will be notified to the applicant by the Boring Engineer, through the Resident Magistrate. The applicant may be requested to give further necessary information before boring is commenced for him.

4.—*Notice of Availability of Drill.*

Each accepted applicant will have at least four days' notice that a drill has been set apart for him. The notice will state where the drill is and the date from which the applicant should take it over. Should he not take it over within three days of the fixed date, he will be liable to forfeit the grant of the drill to him and to pay for the foreman's wages during the delay. The taking over of the drill shall preclude the applicant from any denial of liability for it.

5.—*Classes of Government Drills.*

Government will provide one or other of the following classes of drill, at the discretion of the Boring Engineer, unless some prior arrangement has been made with the applicant:—

(*a*) Steam diamond drill capable of boring a 2¾ inch hole to a depth of 4,000 feet.
(*b*) Steam diamond drill capable of boring a 2¾ inch hole to a depth of 800 feet.
(*c*) Steam percussion (or "jumper") drill capable of boring a 6 inch hole to a depth of 600 feet.
(*d*) Steam rotary "shot" drill capable of boring a 6 inch hole to a depth of 600 feet.

The above drills are all equipped with the necessary tools and appliances and a tent or house for the foreman. For (*a*) the equipment will be arranged for specially as required.

6.—*The Foreman.*

The foreman will be a capable man and will have the entire direct charge of the boring operations. He will receive instructions to meet the applicant's wishes as far as practicable, to use all expedition in carrying out the bore for him, and not to give him unnecessary trouble. Should the applicant have any complaint to make about him, he should prefer it in writing to the Resident Magistrate, who will inquire into the matter. No payment for his services is to be made to the foreman by the applicant.

7.—*Charges.*

The charges to be paid by the applicant will be :—

(*a*) For each day while the plant is being erected or dismantled the sum of 20s.; a similar daily charge of 20s. will be made during pumping tests.

(*b*) For each working day from the erection of the drill, the sum of 40s. (Saturday to be reckoned half a day).

(*c*) For heavy diamond drills, class (*a*), the charge will be by special arrangement.

(*d*) Any breakages for which the applicant is himself responsible.

The cost of replacements or repairs necessitated by boring, pure and simple, will be borne by Government.

(*e*) No charge will be made for periods during which a drill may be stopped for repairs or on account of bad weather or of the illness of the foreman, but full charges must be paid for any delay caused by the applicant.

8.—*Transport.*

(*a*) Government will bear the cost of carriage by rail of the drill, appliances, and foreman in charge thereof, to the railway station or centre nearest to the farm of the first applicant in any district.

(*b*) Government cannot guarantee transport, but where there is a Government transport station available and the applicant cannot himself arrange for the transport of the drill, will provide it for him at the Government rates. Drills cannot, however, be sent out to districts where there is animal sickness or where there are restrictions against the movement of animals.

(*c*) The first applicant will provide transport for the drill and its appliances and for the foreman and his baggage from the station or centre to his farm, and will use all expedition in this respect.

(*d*) A succeeding applicant will similarly provide transport from the previous farm to his own farm, and the last applicant will provide it back to the nearest railway station or centre, if required to do so.

(*e*) The applicant will also, when necessary, provide transport between his farm and the railway station, or such other spot as may be selected, for the conveyance of machinery and stores required to conduct boring operations.

(*f*) The applicant will also provide means of communication to and from the nearest post and telegraph office at least once a week.

9.—*Casing.*

Government will provide free of charge the casing required to line the whole or part of a borehole which is not in solid rock. The amount of casing necessary will be at the discretion of the Boring Engineer.

10.—*Working Hours.*

Working hours on ordinary week-days will be nine per day, except on Saturdays, when they will be five hours, and work will cease at 1 p.m.

No work will be done on Sundays and public holidays, nor will a charge be made for these days.

11.—*Supplies by Applicant.*

(*a*) *Labourers.* Government will provide, free of charge, the natives required for working the drilling machine. The applicant must supply, free of all charges, such other natives as may be required for unloading, erection, dismantling and loading up the plant, and for cartage of water.

(*b*) *Water and Fuel.* The applicant must supply, and transport at his own cost, sufficient fuel (wood or coal) and water for the proper working of the drill, and for the use of the foreman and natives.

(*c*) *Provisions for Foreman.* The applicant must either supply food for the foreman by private arrangement and at reasonable prices, or must bring supplies for him from a store not less than once a month.

(*d*) The applicant must generally give such other assistance as the foreman may require to perform his work efficiently.

12.—*Cessation of Boring.*

Boring may be stopped :—

(*a*) At the applicant's request in writing to the Boring Engineer ;
(*b*) When a fair and reasonable supply of water has been struck ;
(*c*) At the discretion of the Boring Engineer when there is, or is likely to be, any damage to the drill, or further boring is unlikely to yield satisfactory results ;
(*d*) When the borehole is 300 feet deep, unless a special arrangement is made by the applicant with the Boring Engineer to continue it.

13.—*Responsibility for Success.*

Beyond providing an efficient plant, foreman and natives, Government do not guarantee any successful result from the boring operations. The undertaking will, therefore, be entirely at the applicant's risk, but every reasonable assistance towards a successful issue of the work will be readily given.

14.—*Limit of Period of Work and Number of Boreholes.*

A drill will not work on account of any one applicant for a longer period than 48 working days, unless exceptional circumstances justify an extension of this period.

Not more than three boreholes will be sunk on any one property, under one application, except under special sanction. Holes abandoned by order of the Boring Engineer will not be taken into account in this respect.

15.—*Special Conditions.*

Further special conditions, additional to the foregoing, when necessitated by the nature of the ground to be bored in or by difficulty in getting to the site, may be imposed by the Boring Engineer after consultation with the applicant. Their acceptance by the applicant must be definitely notified before any work is undertaken or continued.

16.—*Cores.*

As the Boring Branch is desirous for scientific purposes of collecting cores, showing the strata of the Colony, all cores saved shall be its absolute property. The applicant, however, may closely examine them, and may, if he desires and at the discretion of the Boring Engineer, have small pieces given to him for analytical purposes. Samples of all cores thus acquired by the Government will be carefully kept and registered.

F. A. HURLEY,
Chief Engineer, Irrigation Department.

SPECIFICATION OF HORSES REQUIRED FOR PURCHASE BY THE MILITARY AUTHORITIES.

Horses of three classes are required, viz. :—

Draught ; Cavalry ; and Mounted Infantry.

Draught	15 hands to 15-2.
Cavalry	14-2½ „ 15-2.
Mounted Infantry	14 „ 14-2½.

The class of animal required in each of the three classes may be generally described as short-legged, compace-bodied, practically sound, with good constition and bone to match his size, not under four years or over seven years.

The matter of the horses being broken or unbroken is immaterial, but any horse brought forward for sale must be so far handled that the veterinary examinations as to soundness in walk, trot or gallop can be carried out without delay in the presence of the purchasing officer.

A purchasing officer would be the sole judge of the suitability or otherwise of the animal produced for sale, and he would not buy any animal having any of the following defects :—

(*a*) Small weak quarters ; (*b*) Flat sides ; (*c*) Long weak or very straight pasterns ; (*d*) Split up and leggy ; (*e*) Small bones or points ; (*f*) Close hocks or action ; (*g*) Narrow chest ; (*h*) Signs of brushing ; (*i*) Small or uneven feet ; (*j*) Vice of any kind ; (*k*) Bad withers or signs of fistulous withers ; (*l*) Bad condition ; (*m*) Mis-shaped mouth, or mouth showing evidence of operation to teeth ; (*n*) Capped elbows or very short docks.

Mares and geldings will only be bought, and colour is immaterial.

The Military Authorities will prefer to deal direct with the breeders, and would purchase at any time of the year, and if local Agricultural Associations could at their meetings ascertain what animals could be offered for sale and what centre and date would be most suitable, and notify the same to the Assistant Director of Remounts, at Headquarters, Pretoria, arrangements would then be made for a purchasing officer to attend, but it would be advisable for a month's notice to be given and the collection of horses for inspection should be, having due regard to the seller's convenience, as near the line of railway as possible.

Local Associations should first ascertain from Assistant Director of Remounts, Army Headquarters, whether horses are required.

No fixed price can at present be laid down owing to the scarcity of the class of animal required in this country, but a fair market price would be offered, having in consideration the price of horses available for importation from oversea.

The Military Authorities will not complete the purchase of any animal till it is delivered alive, without injury (which would render it permanently unserviceable), and free from infectious or contagious disease, at a railway station to be fixed by the purchasing officer.

For the care and feeding of such horses as may be selected for purchase and which for any reason it may be impossible to at once entrain, an allowance of 2s. per day will be made to the seller, such allowance not to be payable for the day of purchase but will be allowed for the day of entrainment, provided that 10 lbs. of forage suitable for use on the journey be certified by the entraining officer or conductor to have been placed at his disposal.

The seller will pay for any cost of hire of ground for inspection purposes, and must put a halter or other suitable head-gear on the horse to secure it on the railway journey.

He must also allow the horse to pass the Mallein test with Mallein supplied by the Army Veterinary Department, and this test will be applied before entrainment. Should re-action take place within 72 hours the purchase will not be completed, and the feeding allowance of 2s. only would be paid from the date subsequent to selection to the date certified of re-action.

The purchasing officer on selecting a horse as suitable will at once mark a horse so selected with a burnt brand on the foot and take a description noting all marks on the animal, but such brand will not complete the sale if the safe delivery and Malleining conditions are not carried out.

The purchase money will be paid by cheque by the Assistant Director, Remounts, Pretoria, immediately on receipt of notice from the purchasing officer that the purchase conditions have been completed.

E. N. BANKES, Lieut.,
Staff Officer, Remounts,
For Assistant Director of Remounts, South Africa.

DESTRUCTION OF VERMIN.

The following regulation (Section D of Government Notice No. 1341 of 1906) is published for general information:—

(D.)—VERMIN.

16. The animals named in Schedule F hereto shall be deemed to be vermin, and rewards for the destruction of them shall be paid at the rates shown in the Schedule by the Resident Magistrate of the district in which they are destroyed.

17. Vermin may be destroyed by shooting, coursing, by means of nets, springes, gins, traps, snares, or by poison, provided that when poison is used for the destruction its use shall be subject to such conditions as the Resident Magistrate of the district may prescribe, and provided that no poison may be used during the

18. In proof of the destruction of vermin the applicant for reward will be required to produce in the case of lion, leopard, cheetah, lynx, serval cat, civet cat, Kaffir cat, genet cat, silver jackal and red jackal, the skin with the tail not severed; and in the case of wild dog, hyena and baboon, the head; and will also be required to make a written declaration in the form given in Schedule G hereto.

19. The skins of vermin for the destruction of which reward has been paid shall be the property of the Government, and shall, if in good condition be marked by the official before whom they are produced at the juncture of the tail with the skin of the body with a perforating stamp, or in such other way as the Colonial Secretary may from time to time prescribe, and thereafter be sold by the Resident Magistrate by public auction or disposed of in such other way as he may consider to be best in the interests of the Government. The proceeds of such sale or disposal shall be paid into Revenue.

Skins not in good condition and heads shall be destroyed.

20. Any person who secures or attempts to secure for himself or any other person a reward for the destruction of vermin by means of a false declaration or by the production of skins or heads belonging to vermin, for the destruction of which a reward has already been paid, shall be liable on conviction to a fine not exceeding £10 for every head of vermin for which he has secured or attempted to secure such reward.

SCHEDULE F.

	£	s.	d.
Wild Dog	1	0	0
Silver Jackal	0	2	6
Red Jackal	0	5	0
Baboon	0	2	6

SCHEDULE G.

I, ...

hereby declare that the following animals:—

....

....

....

....

....

have been destroyed by me within the official boundaries of the .... District, and that the skins and tails (or heads) I have produced to the Resident Magistrate actually belonged to such animals.

SOME RECENT ADDITIONS TO THE REFERENCE LIBRARY OF THE AGRICULTURAL DEPARTMENT.

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Industries of the Cape Colony.—Department of Agriculture, Capetown, 1907.

NATAL.

Agricultural Industries and Land Settlement of Natal, 1907.—Agricultural Department, Pietermaritzburg, 1907.

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The Orange River Colony: Its Resources and Development.—Department of Agriculture, Bloemfontein, 1907.

RHODESIA.

Handbook of Rhodesia.—B.S.A. Co., London. 1907.

TRANSVAAL.

Annual Report of the Director of Agriculture for 1905-6.

Transvaal Government Handbook of the South African Products Exhibition, 1907.

GREAT BRITAIN.

The Book of the Pig.—Jas. Long. L. Upcott Gill, London, 1906. 2nd Edition.

The Modern Peach Pruner.—Bréhaut. Journal of Horticulture Office, London, 1866.

The Horse Breeders' Handbook.—J. Osborne. (Published by the Author), London, 1889.

The Handbook of the Polariscope.—Robb & Veley. Macmillan & Co., London, 1882.

Plant Geography upon a Physiological Basis.—Schimper. The Clarendon Press, Oxford, 1903.

The Naturalist on the Amazon.—H. W. Bates. John Murray, London. 1895.

Elementary Botany.—P. Groom. Geo. Bell & Sons, London, 1906. 6th Edition.

The Principles of Stratigraphical Geology.—J. E. Marr. University Press, Cambridge, 1905.

Fruit Trees.—Du Breuil. Crosby, Lockwood & Co., London, 1891. 5th Edition.

The Culture of Fruit Trees in Pots.—J. Brace. John Murray, London, 1904.

Plants and their Ways in South Africa.—Stoneman. Longmans, Green & Co., London, 1906.

The Chemistry of the Garden.—Cousins. Macmillan & Co., London, 1906.

Flesh Foods, with Methods for their Chemical, Microscopical, and Bacteriological Examination.—Mitchell. Griffin & Co., London. 1900.

Veterinary Therapeutics.—E. Wallis Hoare. Baillière, Tindall & Cox, London, 1906. 2nd Edition.

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The Africander Land.—A. R. Colquhoun. John Murray, London, 1906.

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The Book of the Rothamsted Experiments.—A. D. Hall. John Murray, London, 1905.

Practical Sanitation.—G. Reid. Griffin & Co., London, 1906.

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Immunity in Infective Diseases.—E. Metchnikoff. University Press, Cambridge, 1905.

Diseases of Cattle, Sheep, Goats and Swine.—Moussu & Dollar. Gay & Bird, London, 1905.

Sewage Disposal Works.—Crimp. Griffin & Co., London, 1894. 2nd Edition.

Poisons: their Effects and Detection.—A. W. Blyth. Griffin & Co., London. 1906.

The Microtomist's Vade-Mecum.—A. B. Lee. J. & A. Churchill, London, 1905.

Textbook of Tropical Agriculture.—Nicholls. Macmillan & Co., London. 1906.

Cotton.—Burkett and Poe. Constable & Co., London, 1906.

Races of Domestic Poultry.—E. Brown. E. Arnold, London, 1906.

Horses for the Army.—Sir W. Gilbey. Vinton & Co., London, 1906.

British East Africa.—Lord Hindlip. T. Fisher Unwin, London, 1905.

The Romanes Lecture, 1902, "The Relations of the Advanced and Backward Races of Mankind."—J. Bryce. Clarendon Press, Oxford, 1903.

Sugar and the Sugar Cane.—N. Deerr. Norman Rodger, Manchester, 1905.

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Wasps Social and Solitary.—Peckham. Constable & Co., London, 1905.

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The Uses of British Plants.—Henslow. Lovell, Reeve & Co., London, 1905.

The Chemistry of Essential Oils and Artificial Perfumes.—Parry. Scott, Greenwood & Co., London. 1899.

The Textile Fibres of Commerce.—W. I. Hannan. Griffin & Co., London, 1902.

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Modern Dairy Farming.—H. L. Puxley. L. Upcott Gill, London, 1906.

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Desert Botanical Laboratory of the Carnegie Institution.—Coville and MacDougal. Carnegie Institution, Washington, 1903.

Ginseng.—M. G. Kains. Orange Judd Co., New York, 1899.

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Dairy Chemistry.—H. Snyder. The MacMillan Co., New York, 1906.

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S. W. WAGSTAFF,
Librarian.

TRANSVAAL METEOROLOGICAL DEPARTMENT.

RAINFALL RETURNS FOR THE MONTHS OF MAY, JUNE, AND JULY, 1907.

MAY, 1907.

NOTE. The rainy season is measured from 1st July in one year to the 30th June in the next.

District.	Place.	Month. May, 1907. Ins.	Month. May, 1907. Days.	Season. From 1st July, 1906. Ins.	Season. From 1st July, 1906. Days.
Barberton ...	Barberton ...	0·10	2	36·05	98
	Komati Poort ...	0·15	1	45·30	87
Bethal ...	Bethal ...	0·49	6	34·74	90
Bloemhof ...	Bloemhof ...	1·05	8	24·48	93
Carolina ...	Carolina ...	0·06	3	—	
Ermelo ...	Ermelo ...	0·12	3	39·15	97
Heidelberg...	Heidelberg ...	0·13	3	27·95	92
	Vereeniging ...	0·50	9	30·56	98
Lichtenburg ...	Lichtenburg ...	0·33	6	26·12	86
Lydenburg ...	Belfast ...	0·14	4	34·58	118
	Pilgrims Rest ...	0·14	4	46·76	146
Marico ...	Zeerust ...	0,42	4	30·17	81
Middelburg ...	Middelburg ...	0·45	4	37·16	106
Piet Retief...	Piet Retief ...	0·38	3	41·46	61
Potchefstroom ...	Potchefstroom ...	0·83	5	30·85	84
	Klerksdorp ...	0·98	6	35·64	95
Pretoria ...	Arcadia, Pretoria ...	0·14	2	32·82	92
	Modderfontein ...	0·53	5	35·21	92
Rustenburg ...	Rustenburg ...	0·36	2	32·07	78
Standerton ...	Standerton ...	0·50	8		—
Swaziland ...	Mbabane ...	0·28	5	54·78	127
Wakkerstroom ...	Wakkerstroom ...	0·24	4	32·38	82
	Volksrust ...	0·36	5	48·15	117
Waterberg...	Nylstroom ...	0·45	1	33·41	68
	Potgietersrust ...	0·01	1	37·31	81
Witwatersrand ...	Joubert Park, Johannesburg ...	0·27	4	38·63	99
	Government Observatory ...	0·19	3	34·86	97
	Krugersdorp ...	0·26	3	32·76	97
	Zuurbekom ...	0·27	5	28·54	100
Wolmaransstad ...	Wolmaransstad ...	2·15	8	27·24	84
Zoutpansberg ...	Pietersburg ...	0·00	0	33·74	75
	Louis Trichardt ...	0·38	5	48·17	132
	Leydsdorp ...	0·55	4	—	—

SUMMARY.—Except in the neighbourhood of Pietersburg, measurable rainfall was recorded at all stations in May. The rainfall was unusually copious in the W. and S.W. of the Colony, where in some places up to 2 inches and over was recorded. Nearly half an inch of rain fell over the S.E. districts, Standerton, Bethal, Middelburg, and Central Zoutpansberg. These rains and the absence of dry winds, have kept the country moist. Rainfall for the season is generally about 25 per cent. above the average.

OBSERVERS' WEATHER REPORTS FOR MAY, 1907.

BARBERTON DISTRICT.—

Barberton.—The month has been for the most part fine and clear, but there is more moisture about than usual and the grass is at present too damp for extensive fires such as occurred during this month last year. At the end of the month a late fall of rain occurred followed by an unusually cold period.—(J. B. Drake.)

BLOEMHOF DISTRICT.—

Bloemhof.—Beautiful and mild weather for most part of month with unusual rains; sudden change in latter part to very cold from S.W. Remarkable storms of thunder and lightning following nights of frosts. Good deal of cloud.—(C. C. Campbell.)

CAROLINA DISTRICT.—

Carolina.—During the first three weeks of the month the weather continued mild, except the 5th and 6th, when cold windy days were experienced. Since the 28th, however, the change has been very marked, and for the greater part cold windy weather prevailed. On the 29th, the thermometer dropped to 20.3°. The first severe fall of frost of the season occurred on the seventh. The rainfall amounted to 0.06 ins. only, distributed over three days.—(S. J. van Wyk.)

ERMELO DISTRICT.—

De Hoop.—A delightful, though dry, month; storms on 22nd and 24th round about, but no rain fell here; frost unusually late.—(Capt. C. W. Alston.)

Elspan.—From morning of 27th to evening of 28th it was bitterly cold, wind from W. and N.; wind dropped on morning of 28th, and there was a very severe frost, killing many plants. Wind again got up about 8 a.m. on 28th and died away about 5 p.m. on same day. Another sharp frost was experienced the following morning.—(A. Middleton.)

Ermelo.—The weather during May was mild and dry. A change on the 27th blew up from the W. one of the hardest frosts ever experienced here. Taps and piping burst all over the village. The cold snaps continued to the end of the month.—(Mrs. S. M. Nicolson.)

MARICO DISTRICT.—

Ottoshoop.—Such late rains as have fallen this May have not been known locally since the year 1893.—(W. Dyke Poynter, J.P.)

MIDDELBURG DISTRICT.—

Middelburg.—There is little to relate this month but the advent of the rigours of winter. A few mild dust-storms, hardly worthy the name; plenty of dust and dry bleached veld in the country. A few welcome showers and one heavy thunderstorm with most vivid and various coloured lightning, the noisiest of the year. The frosts, however, have been unusually severe for the month of May, and were ushered in by a bleak S.W. wind, and seem here to stay. Ten degrees of frost were registered on the 28th and 29th, the ground being white with frost in the early morning, giving the appearance of a fall of snow.—(Dr. H. A. Spencer.)

POTCHEFSTROOM DISTRICT.—

Potchefstroom.—The main feature of the month was the heavy frosts which were registered, and also the occasional light showers of rain which fell during the month, an incident which the oldest inhabitants declare is exceptional. Very cold days were experienced towards the latter part of the month, but happily the weather was calm. Twelve degrees of frost registered on 28th.—(F. Glen Leary.)

Ventersdorp.—Weather during month has been rather mild for the season of the year and high winds from N. to N.W. prevailed throughout the month. On Monday 27th, a sudden change set in, wind changing to S. and sharp frosts were experienced for three mornings; lowest temperature on the 29th, 21.6°. Total

rainfall for month 0.39 ins., which enabled farmers to do some ploughing. Locusts still about in smaller swarms, continue to do damage, and grazing very scarce in consequence.—(W. H. Warden, S.A.C.)

PRETORIA DISTRICT.—

Roberts Heights.—This month seems to have seen the finish of the rains and the setting in of winter. The lowest temperature registered was 16.8° by the grass minimum thermometer, and 20.1° in the screen, during the night of the 28th.—(Pte. F. P. Hughes, R.A.M.C.)

RUSTENBURG DISTRICT.—

Rustenburg.—A slight frost was experienced on 29th inst.; farmers trust the end of the horse-sickness season is at hand.—(Head Const. D. Allam, S.A.C.)

Wolhuterskop.—Generally, rather cloudy month, but practically no rain fell; a good deal of wind all through, and a sudden cold spell at the end.—(J. C. P. Maynard.)

STANDERTON DISTRICT.—

Standerton.—Bright genial weather; very little dust; strong winds; nights very cold towards latter end of month.—(F. Crook.)

SWAZILAND DISTRICT.—

Pigg's Peak.—Cold towards the end of the month; warm in sun by day; cold evenings and nights.—(Dr. F. Penny.)

WAKKERSTROOM DISTRICT.—

Volksrust.—Very severe frosts at end of month with very cold N.W. winds. Veld is now dry and burning is going on all over the country. Average amount of sunshine, but, owing to cold winds, was not effective in giving warmth in daytime.—(Const. R. G. Smith, S.A.C.)

Wakkerstroom.—Bright weather during month; cold nights and mornings, with frost towards latter end of month.—(J. M. Keith.)

WATERBERG DISTRICT.—

Potgietersrust.—Delightful weather for first part of month, when a sudden change came with wind from SS.E. and frost at night which did a great deal of damage to gardens, especially on the night of the 28th, when seven degrees of frost were registered. Veld fires are numerous.—(Lance-Corp. C. Kendall, S.A.C.)

ZOUTPANSBERG DISTRICT.—

Chunes Poort.—Month in general very warm; mean max., 77.6°; mean min., 44.3°; average mean, 60.9°; highest max., 84.4° (2nd); lowest min., 23.7° (29th). Ice quarter of an inch thick in iron kitchen, and two inches in open air on basins, etc., on 29th. River still running strongly. Locusts every day.—(Cyril C. Hicks.)

Krabbefontein.—Cold weather has set in very early and appears to be more severe than is usual, minimum temperature on night of 28th falling to 30.5°, being the first time frost has been registered since this station was established in January, 1904.—(C. H. Ricketts.)

Leydsdorp.—Fine month; very cold towards the end.—(A. Chandler.)

Louis Trichardt.—The beginning of the month was cold and damp after which there was very brilliant fine weather. A heavy frost fell on the 29th, which was the coldest night for the last two years. Locusts have passed over during the month.—(G. E. McLeod.)

New Agatha.—The month has been cold and dry on the whole with some high winds and occasional dull days.—(H. D. Molyneux.)

Elim, Spelonken.—Temperature rather mild for the season up to the 26th, when a cold wind in the upper regions condensed the vapours, bringing down a few drops of rain; during the night the Western Kalahari wind fell very sharply to freezing point in the hollow places, when all green vegetation was suddenly withered, bearing quite a winter appearance. This is almost 10° less than our minima for last year. Enjoying very invigorating weather now.—(H. Mingard.)

R. T. A. INNES, *Director*,
Transvaal Meteorological Department.

Government Observatory,
Johannesburg, 10th June, 1907.

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JUNE, 1907.

District.	Place.	Month. June, 1907. Ins.	Month. June, 1907. Days.	Season. From 1st July, 1906. Ins.	Season. From 1st July, 1906. Days.
Barberton	Barberton	Nil	0	36·05	98
Bethal	Bethal	,,	0	34·74	90
Bloemhof	Bloemhof	,,	0	24·48	93
Carolina	Carolina	,,	0	—	—
Ermelo	Ermelo	,,	0	39·15	97
Heidelberg	Heidelberg	,,	0	30·90	80
	Vereeniging	,,	0	30·56	98
Lichtenburg	Lichtenburg	,,	0	26·12	86
Lydenburg	Belfast	,,	0	34·59	118
	Pilgrims Rest	0·14	3	46·90	149
Marico	Zeerust	Nil	0	31·17	81
Middelburg	Middelburg	,,	0	37·16	106
Piet Retief...	Piet Retief	,,	0	41·46	61
Potchefstroom	Potchefstroom	,,	0	30·85	84
	Klerksdorp	,,	0	35·64	95
Pretoria	Arcadia, Pretoria	,,	0	32·82	92
	Modderfontein	,,	0	35·21	92
Rustenburg	Rustenburg	,,	0	32·07	78
Standerton	Standerton	0·05	1	—	—
Swaziland	Mbabane	0·11	2	54.92	129
Wakkerstroom	Wakkerstroom	Nil	0	32·38	82
	Volksrust	,,	0	48·15	117
Waterberg...	Nylstroom	,,	0	33·41	68
	Potgietersrust	0·10	1	37·41	82
Witwatersrand	Joubert Park, Johannesburg ...	Nil	0	38·63	99
	Government Observatory	,,	0	34.86	97
	Krugersdorp	,,	0	32·76	97
Wolmaransstad	Wolmaransstad	,,	0	27·24	84
Zoutpansberg	Pietersburg...	,,	0	33·74	75
	Louis Trichardt	0·16	2	48·33	134
	Leydsdorp	0·06	4	—	—

June, as usual, has been practically rainless, some light showers only having fallen at a few isolated places in the S.E. and N.E. of the Transvaal.

OBSERVERS' WEATHER REPORTS FOR JUNE, 1907.

BLOEMHOF DISTRICT.—

Bloemhof.—Beautiful and cold weather; **light winds and calms; heavy frosts; abnormal quantity of cloud.—(C. C. Campbell.)**

CAROLINA DISTRICT.—

Carolina.—**It has not at any time been very cold this month, although we cannot be said to have experienced mild weather. Following upon heavy frosts, the mornings were usually fine up to about 9.30 a.m., but this was generally followed by cold, unpleasant winds. Rainfall for the month, nil; highest temperature 68.3° on the 25th; lowest 22.8° on the 4th.—(S. J. van Wyk.)**

ERMELO DISTRICT.—

***Ermelo (A).*—Evenings cold with frosts in the mornings; mild during the day with a few windy days.—(C. D. Lucas.)**

Ermelo (B).—The weather in June has been exceptionally calm and mild; beautiful sunny days and very white frosts at night prevailed almost continuously. —(Mrs. S. M. Nicolson.)

Lake Chrissie.—This month has brought us heavier frosts than last June, but the cold has not been so continuous, and there has been less wind.—(Rhys Maitland, J.P.)

HEIDELBERG DISTRICT.—

Heidelberg.—A very dry month, with no rainfall and clear skies during the greater part. Radiation frosts were of almost nightly occurrence and there were two periods of severe frosts accompanied by southerly winds, viz., the 3rd—5th, and 20th—24th, the former being unusually severe. A good month for harvesting operations; good mealie crops throughout the district except where locusts had destroyed late crops. Winds generally light to moderate, dropping to calm in the evenings.—(L. M. Foggin.)

LYDENBURG DISTRICT.—

Bushbuck Ridge.—A fine dry month; the absence of high winds which generally marks the month of June had beneficial effects on crops; heavy frosts in valleys and near water.—(Colonel F. Steinacker.)

MIDDELBURG DISTRICT.—

Middelburg.—After good rains for 9 months (since September last year) we have experienced our first dry month, no rain having fallen. In this respect, this month has been in accord with those of the previous three years. In other respects, however, this month has differed from those of the previous three years in showing higher mean maximum and minimum temperatures, in fact, in being more equable; also in the fact that the rivers and spruits in the district are still running unusually strongly. In the early part of the month several cloudy days were experienced, the sky being completely clouded over and looking as though rain might still be expected. In the latter part of the month a good many windy days with dust and a few real duststorms were experienced, cold E. and S.E. winds being much in evidence. Frosty nights have been recorded on 19 out of the 30 days of the month.—(Dr. H. A. Spencer.)

POTCHEFSTROOM DISTRICT.—

Potchefstroom.—The weather has been very mild for this time of the year; the days were bright and fine, with light winds from the S.; no rain was registered.—(F. Glen Leary.)

Ventersdorp.—On the whole the weather has been rather mild for June; winds as a rule blowing from the N. and N.W., occasionally shifting to the S. and S.W.; no rain was registered; highest maximum temperature on the 27th, 71.6°; lowest minimum on 3rd, 22.6°. Farmers ploughing throughout the month.—(W. H. Warden, S.A.C.)

PRETORIA DISTRICT.—

Roberts Heights.—The lowest reading of the grass minimum thermometer was 9.3° on the morning of the 28th, characterised by a dew and heavy hoar frost. Light rain on the 15th; occasional winds rising about 11 o'clock and dying down in the afternoon with one or two dust-whirls have been noticed.—(Pte. C. G. Cummings, R.A.M.C.)

STANDERTON DISTRICT.—

Standerton.—Bright, warm, genial days; very cold at night; very little dust during days; prevailing winds from E. and N.E.; river level almost stationary. —(Fred Crook.)

WAKKERSTROOM DISTRICT.—

Volksrust.—No rainfall; prevailing wind from N.W., gentle in morning but gaining force during the day; frost was experienced on 24 days; very little moisture of any kind during month; trees have been badly nipped by the frost.—(P. G. Smith, S.A.C.)

Wakkerstroom.—Very dry month, with high winds during night and early morning; mild during day.—(J. M. Leith.)

WATERBERG DISTRICT.—

Nylstroom.—The month as a whole has been a very fine one, the early mornings showing an unusual number of cloudless skies, while at the same time, there was so little wind that in the majority of cases a *nil* return had to be given. It is noticeable that we get a certain amount of wind during the latter part of the day, but never very much. Veld fires are now numerous, some of them very large and present very interesting spectacles at night-time. The country is now drying up owing to the rains having stopped.—(Constable G. E. Truscott, S.A.C.)

Potgietersrust.—Genial weather for first part of month; very cold winds after the 15th, and nights very cold; haze upon several mornings at sunrise. A few showers of rain fell upon hills surrounding village but none fell in valley.—(L.-Cpl. C. Kendall, S.A.C.)

ZOUTPANSBERG DISTRICT.—

Chunes Poort.—No noteworthy facts this month, rather a lot of dull weather early in month; river still running strongly; not much wind.—(Cyril C. Hicks.)

Krabbefontein.—Dry and bright; very cold nights.—(C. H. Ricketts.)

Leydsdorp.—Very cool month.—(A. Chandler.)

Woodbush.—Weather very fine all through the month.—(C. E. Lane-Poole.)

R. T. A. INNES, *Director*,
Transvaal Meteorological Department.

Government Observatory,
Johannesburg, 8th July, 1907.

JULY, 1907.

No detailed rainfall return is made out for this month; as with very few exceptions July has been rainless at all stations. Some very light showers occurred on July 22nd and 24th over the southern districts of the Colony, and occasional light rains have fallen over the Lydenburg and Zoutpansberg Districts. The following amounts have been recorded for the month:—

Komatipoort	0.01	ins.	on	1	day.
Ermelo (District)	0.04	„	„	1	„
Heidelberg	0.01	„	„	1	„
Pilgrims Rest	0.05	„	„	2	„
Wolmaransstad	0.01	„	„	1	„
Louis Trichardt	0.11	„	„	2	„
Leydsdorp	0.01	„	„	1	„

The average rainfall for July as measured at Pretoria is 0.05 ins.

OBSERVERS' WEATHER REPORTS FOR JULY, 1907.

BARBERTON DISTRICT.—

Barberton.—The month has been clear and warm, and marked by several strong winds rising after mid-day and blowing into the night. The water supply in the district is still good, and many parts of the veld, burnt early in the year, are now green. Veld burning is still going on constantly.—(J. B. Drake.)

CAROLINA DISTRICT.—

Carolina.—The weather has been fine and exceptionally mild throughout the month, with occasional cold, windy days. The mornings were fine, almost without exception. Frost was very severe at times. Highest temperature during the month, 66.9°, on the 19th; lowest, 21.1°, on the 11th.—(S. J. van Wyk.)

ERMELO DISTRICT.—

Hereford, E. Ermelo.—The month began with regular frosts, during the second week the ground being white with hoar frost every morning, but there was very little ice here. This was followed by mild weather, and growth commenced in grass and trees, but frosts occurred again during the last week, though they were but slight. It has been a calm, bright month, as a whole, though a slight shower of rain fell on the evening of the 29th.—(Rhys Maitland, J.P.)

Ermelo.—Frosts were recorded on 25 mornings during the month by the Grass Minimum Thermometer. Fine days were experienced, except on a few days when strong winds were blowing from the W. and E.; several mornings were very hazy.—(G. J. Imrie.)

HEIDELBERG DISTRICT.—

Heidelberg.—The weather has been brilliant and mild; the country is getting dry; fountains are drying up.—(W. A. ter Horst.)

MIDDELBURG DISTRICT.—

This, the second dry month of this winter, has been much as the last, with bright warm days and frosty nights predominating. There has been but little wind, and therefore duststorms have been rare. A few cloudy days occurred, which promised an early advent of the rains this year. In many gardens, fruit trees are in full bud, whilst here and there early peach is in blossom. The rivers, streams and springs are still running freely for so late in the year.—(Dr. H. A. Spencer.)

POTCHEFSTROOM DISTRICT.—

Ventersdorp.—July has been fairly cold, the minimum temperatures, however, have not been so low as in July, 1906. The month was fairly free from cold winds: no rain fell, although from 16th to 24th a good deal of cloud obscured the sky, chiefly of the alto-cumulus type.—(Sergt. W. H. Warden, S.A.C.)

PRETORIA DISTRICT.—

Roberts Heights.—Rather mild, bright days, with more or less haze obscuring the sky; very little strong wind: in the morning, hoar frosts were rather common; as a whole, the ordinary weather occurring in July prevailed.—(Pte. E. G. Cummings, R.A.M.C.)

STANDERTON DISTRICT.—

Standerton.—Very cold at night; bright, genial, warm days; occasional light winds.—(F. Crook.)

WAKKERSTROOM DISTRICT.—

Wakkerstroom.—Bright genial weather during the month: frosts at night; mild during day, with light winds; plants and trees budding; heavy mists with deposit on four mornings.—(J. M. Keith.)

WITWATERSRAND DISTRICT.—

Zuurbekom.—Mirage very prominent during the first half of the month; usually calm in early mornings, wind gradually rising as day advanced; more or less haze during the whole month.—(G. L. MacGregor.)

ZOUTPANSBERG DISTRICT.—

Krabbefontein.—Very dry month; days bright and cool; nights cold.—(C. Howard Ricketts.)

Mamathola.—The month has been cold but fine, with occasional dull days; light showers on the night of the 21st.—(H. W. Molyneux.)

Woodbush.—Whole month was very fine, only one day without sunshine; frost on one night.—(C. E. Lane Poole.)

R. T. A. INNES, *Director,*
Transvaal Meteorological Department.

Government Observatory,
Johannesburg, 6th August, 1907.

RAINFALL OVER THE TRANSVAAL: FROM OLD DATA.

	Pretoria.		Johannesburg.		Barberton.								Swaziland.
	Govt. Bldgs.	Arcadia.	J'bert. Park.	Centr'l WWR.	Town.	K'psche Hoop.	Ermelo.	Pilgrims Rest.	Sabie.	Vereeniging.	Klerksdorp.	Dynamite Factory.	Schroedershof.
SEASON													
1885-86	...	...	...	...	...	...	...	42·72	...	...	..	...	...
1886-87	...	...	...	...	...	...	...	41·05	...	...	...	...	...
1887-88	...	...	...	...	...	..	...	47·43	...	...	...	...	...
1888-89	..	...	24·56	...	34·35	...	...	35·73	...	...	...	...	...
1889-90	...	...	21·66	...	34·29	...	...	45·43	...	...	...	...	...
1890-91	...	...	43·39	...	34·87	...	...	46·06	...	...	..	...	...
1891-92	22·30	...	28·15	...	26·70	..	...	34·34	...	...	...	...	...
1892-93	33·48	...	28.00	...	32·28	59·75	...	45·56	.	...	...	...	...
1893-94	37·04	...	40·16	...	49·05	57·41	...	54·57	...	...	...	...	...
1894-95	27·68	...	32·11	...	38·54	53·74	...	36·99	...	...	...	...	...
1895-96	23·91	...	22·28	...	30·90	36·51	22·26	...	...	...	20·76	...	...
1896-97	20·86	...	32·05	...	26·00	46·80	25·76	...	...	...	19·20	...	..
1897-98	27·82	...	28·89	24·47	32·78	51·24	51·27	...	.	...	20·67	23·11	.
1898-99	19·23	...	25·36	23·11	...	...	18·69	..	34·76	...	17·59	16·82	..
1899-00	25·52	...	29·12	28·06	...	...	25·99	...	38·15	...	...	21·50	21·86
1900-01	26·05	...	35·88	32·23	...	...	36·75	...	...	...	...	31·33	29·42
1901-02	28·90	...	36·22	32·28	...	...	...	...	...	28·10	21·95	30·77	38·40
1902-03	24·98	28·88	29·66	28·88	...	...	...	...	32·93	21·87	...	25·51	22·12
1903-04	28·42	31·72	31·98	31·27	27·75	...	...	...	53·61	23·37	'20·32	28·97	...
1904-05	21·55	...	26·14	23·74	24·59	...	31·54	33·59	38·25	22·47	14·83	21·40	26·59
1905-06	19·69	20·61	29·53	27·50	19·52	40·98	26·85	28·76	31·18	22·16	21·95	23·00	...
1906-07	29·27	32·82	38·63	...	36·05	...	39·15	46·90	69·20	30·56	35·64	35·21	51·55

This table gives the annual amounts of the rainfall at those stations at which rainfall measurements have been made for a long series of years. Pilgrims Rest has the oldest rainfall observations, going back to 1885, but unfortunately there is a long break in the series from 1895 to 1903.

From these records it appears that the rainfall of the present season 1906-07 is the third heaviest amount during the last twenty-two years. The wettest seasons during this period have been those of 1887-88, 1890-91, 1893-94, and 1906-07. The dry seasons have been 1899-90, 1895-96, 1898-99, 1904-05, and 1905-06. At Pilgrims Rest the rainfall has varied from 54.57 inches in 1893-94 to 28.76 in 1905-06, and at Joubert Park, Johannesburg, from 43.39 inches in 1890-91 to 21.66 inches in 1889-90.

PRETORIA AND JOHANNESBURG PRODUCE MARKET PRICES.

(Supplied by the Commercial Agency Co., Limited, Seed and Produce Merchants, No. 116, Vermeulen Street, Telephone No. 165, Box 784, Pretoria; and by Messrs. Hubert Morisse & Co., Produce Merchants and Commission Agents, Loveday and Frederick Streets, Box 63, Johannesburg.)

PRETORIA.

Description.	*June*, 1907.		*July*, 1907.		*August*, 1907.	
	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Forage, per 100 bundles ...	1 0 0	1 10 0	0 19 0	1 18 0	0 19 0	1 7 6
,, ,, (inferior)	0 7 0	0 18 0	0 10 0	0 12 0	—	—
Mealies, per bag (White)...	0 9 0	0 13 6	0 8 0	0 10 3	0 8 3	0 9 9
,, ,, (Yellow)	0 10 0	0 11 6	0 8 3	0 10 3	0 8 0	0 9 3
,, ,, (Mixed)...	0 9 3	0 11 6	0 8 0	0 9 6	—	—
Kaffir Corn, per bag ...	0 12 0	0 14 3	0 8 9	0 15 3	0 12 3	—
Wheat, per bag	—	—	1 0 0	1 2 6	0 19 0	—
Oats, per bag	0 14 0	—	0 15 0	—	—	—
Barley, per bag	0 11 6	—	0 9 10	0 10 0	—	—
Bran, per bag	0 5 6	0 10 6	0 9 0	0 10 6	0 8 9	0 9 6
Chaff, per bale	0 4 6	0 9 3	0 5 0	0 8 6	0 2 7	0 7 9
Grass, ,, ...	0 0 4	0 3 6	0 0 1	0 1 6	0 0 3	0 2 6
Green Lucerne, per doz. bdls.	0 1 9	0 2 6	0 0 6	0 2 6	0 0 9	0 2 3
Green Barley, per doz. bdls.	0 1 6	0 2 6	0 0 9	0 1 6	0 0 10	0 1 6
Potatoes, per bag	0 10 6	0 18 0	0 9 0	1 0 6	0 6 0	0 16 6
Onions, per bag	0 10 6	0 12 0	0 6 0	0 13 0	0 14 6	0 16 6
Sweet Potatoes, per bag ...	0 4 0	0 6 0	0 2 3	0 9 9	0 3 9	0 6 0
Pumpkins	0 0 3	0 0 8	0 0 3	0 0 6	0 0 3	0 0 6
Oranges, per 100	0 2 0	0 6 3	0 1 6	0 4 6	0 1 6	0 4 9
Naartjes, per 100	0 1 3	0 6 0	0 0 9	0 5 9	0 1 2	0 4 6
Lemons, per 100	0 1 3	0 3 0	0 1 0	0 3 0	0 1 0	0 3 0
Eggs, per doz.	0 1 5	0 2 3	0 1 4	0 2 10	0 0 8½	0 1 3
Fowls, each	0 1 5	0 2 6	0 2 0	0 3 3	0 1 6	0 3 0
Ducks, each	0 2 0	0 3 1	0 2 10	0 3 2	0 2 4	0 3 0
Guinea Fowls, each ...	0 2 0	—	—	—		—
Turkeys, each	0 6 9	0 12 0	0 4 6	0 14 0	0 2 6	0 11 0
Geese, each...	—	—	—	—	0 6 9	—
Tobacco, per roll	0 0 4½	0 1 0	0 0 3	0 0 9	0 0 7	0 1 4
,, cut, per lb. ...	0 0 1	0 0 3	—	—	—	—
,, Leaf, per lb. ...	—	—	—	—	—	—
Pigs, each	0 13 6	3 0 0	0 8 6	4 8 0	0 18 0	3 0 0
Wood, per load	0 14 0	3 15 0	0 12 0	2 7 6	0 16 0	3 7 6
Butter, per lb.	0 1 4	0 1 6	0 1 6	—	—	—
Lucerne, per bale	—	—	0 4 0	0 9 0	—	—
Sun Flower Seed, per bag	0 4 0	—	—	—	0 4 9	0 6 0

JOHANNESBURG.

Description.	*June*, 1907.						*July*, 1907.						*August*, 1907.					
	Lowest.			Highest.			Lowest.			Highest.			Lowest.			Highest.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Barley, per 163 lbs. ...	0	8	6	0	12	0	0	7	6	0	11	0	0	7	6	0	10	6
Bran, per 100 lbs. (Colonial)	0	8	9	0	9	9	0	8	6	0	9	0	0	7	6	0	8	6
Chaff, best, per 100 lbs. ...	0	4	6	0	5	6	0	3	6	0	4	9	0	3	6	0	4	9
„ medium „ ...	0	3	0	0	3	6	0	3	0	0	3	6	0	2	0	0	3	6
Eggs, per doz. (Colonial) ...	0	1	4	0	1	9	0	1	3	0	1	6	0	1	0	0	1	3
Salt, per bag	0	6	0	0	7	0	0	6	6	0	7	3	0	7	0	0	7	3
Forage, (Transvaal) ...	0	7	6	0	8	0	0	6	6	0	7	9	0	6	6	0	7	9
„ (Col'nal) best per 100lbs	0	7	6	0	8	3	0	6	9	0	7	9	0	7	0	0	7	9
„ „ med. „	0	5	9	0	7	0	0	4	9	0	7	0	0	4	9	0	6	6
S. Meal, good	1	3	6	1	4	6	1	3	6	1	4	6	1	3	6	1	4	6
Rye	0	9	0	0	14	0	0	8	6	0	13	0	0	8	6	0	10	0
Wheat	0	18	6	1	2	3	0	17	0	1	0	0	0	17	0	0	19	6
Mealies, Hickory King Whites	0	9	3	0	9	6	0	8	0	0	8	9	0	7	9	0	8	6
„ (O.R.C.) Whites ...	0	8	9	0	9	3	0	8	9	0	9	3	0	7	9	0	8	3
„ Yellow	0	9	0	0	9	9	0	7	9	0	9	3	0	7	9	0	8	3
Kaffir Corn, per 203 lbs ...	0	10	3	0	12	6	0	10	9	0	12	9	0	10	9	0	12	9
Hay, sweet (Transvaal) ...	0	1	0	0	2	5	0	1	0	0	2	0	0	1	1	0	2	3
Lucerne, per 100 lbs. ...	0	5	3	0	7	3	0	5	6	0	6	9	0	5	0	0	6	6
Transvaal Hay	0	0	8	0	1	5	0	0	7	0	1	5	0	0	8	0	1	5
Oats per 133 lbs.	0	9	9	0	14	6	0	7	6	0	14	6	0	9	0	0	14	6
Potatoes, best, per 163 lbs.	0	11	6	0	14	6	0	9	0	0	15	6	0	9	6	0	15	0
„ med. „ ...	0	9	6	0	12	0	0	6	6	0	9	6	0	6	6	0	10	0
„ inferior „ ...	0	6	0	0	9	6	0	5	0	0	7	9	0	5	0	0	6	0
Onions, good, per 125 lbs....	0	10	3	0	11	6	0	9	6	0	11	6	0	10	6	0	15	6
Pigs, live weight, per lb. ...	0	0	3	0	0	3¾	0	0	3	0	0	4¼	0	0	2½	0	0	3½
Turkeys, cocks	0	4	0	0	10	0	0	4	6	0	9	0	0	4	6	0	9	6
„ hens	0	3	6	0	4	6	0	3	6	0	4	6	0	3	6	0	5	6
Fowls	0	1	6	0	3	0	0	1	6	0	3	6	0	1	9	0	3	6
Ducks	0	2	0	0	3	3	0	2	2	0	3	3	0	2	6	0	3	3
Geese	0	5	6	0	6	0	0	5	0	0	6	0	0	5	0	0	6	0
Pigeons	0	0	10	0	1	0	0	0	8	0	0	10	0	0	8	0	0	10
Bedding, per bale	0	0	6	0	1	0	0	0	6	0	1	0	0	0	6	0	1	0
Grass, per bale	0	1	0	0	1	2	0	1	0	0	1	2	0	1	0	0	1	2
Butter (O.R.C.), per lb. ...	0	1	0	0	1	2	0	1	0	0	1	2	0	1	0	0	1	2
Pumpkins, per 100 lbs. ...	0	1	9	0	2	0	0	1	9	0	3	0	0	2	6	0	3	0
Beans, sound, per 200 lbs...	0	14	6	1	16	0	0	15	0	2	2	6	0	14	0	2	2	6

Citrus Scales in the Transvaal.

A. Soft Scale (*Coccus hesperidum*, Linn.)
B. Mussel Scale (*Lepidosophes beckii*, Neum.)
C.—Florida Red Scale (*Chrysomphalus aonidum*, Linn.)
D. Long or Glover's Scale (*Lepidosophes gloverii*, Pack.)
E. Red Scale (*Chrysomphalus aurantii*, Mask.)

PINX. S. M STENT

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THE PREVENTION AND ERADICATION OF STOCK DISEASES IN SOUTH AFRICA.*

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THE subject I have chosen for to-night's paper seems to comprise the whole of Veterinary Science, but as it will be impossible to enter into the details of so many diseases, I shall confine myself to those broad principles which should guide us in their eradication and prevention. As you are all aware, "etiology" is the science of the cause of a disease, and the old-standing principle in logical deductions, "Cessat causa cessat effectus" (Remove the cause and the effect will disappear), is the first principle of hygiene. Therefore, in commencing a successful campaign against any disease we must first of all enquire into the cause, and when the cause has been recognised, then we are able to judge of the purpose of hygienic measures, which is the weakest link in the chain of its development, and this fact once ascertained can be utilised in eradication and prevention.

I will now make a rapid review of the various stock diseases imported to South Africa, and, from a hygienic point of view, try to explain the great question of Prophylactic Veterinary Science. For several years South Africa has been considered the land of plagues, and when a new pest appeared the farmers of this country stood aghast and asked, "what is coming next?" Indeed, the lot of a stock-farmer seems to have been a difficult one during the last twenty years, and it is not surprising that, with the advent of a new disease, he is inclined to lose heart in his occupation.

As far as I am aware the first epidemic of any importance was that noticed in 1854, when a bull imported from Holland introduced

* Being a paper read at the Third Annual Congress of the Inter-Colonial Agricultural Union of South Africa, held in Pretoria.

pleuro-pneumonia, or, as you know it, "lung sickness." Soon after the disease appeared on the coast a half-hearted attempt was made to stamp it out, but, in view of the slight knowledge in vogue at the time, it failed, and the disease subsequently spread all over South Africa, causing damage amounting to millions of pounds sterling.

From time to time attempts have been made to eradicate lung-sickness by various means, yet the scourge is still present, and although the Colonies have been able to reduce the danger to a minimum, it still forms a menace to the whole of South Africa. With the importation of this pest also came a practical method of prevention by means of inoculation which has undoubtedly rendered great assistance in saving cattle, and which, utilised together with the proper legislative measures, will help to its final extermination. Previous to 1854, pleuro-pneumonia had been raging in Europe, but, by means of prophylactic principles, it has been completely eradicated from amongst the many millions of head of cattle abounding all over Europe at the present time. But Europe does not furnish the only example; we need but refer to the Transvaal where the vigorous steps taken during the past four years have been attended with similar success, the occasional outbreaks, almost without exception, being due to the importation of infected cattle.

* * * *

Rinderpest is a devastating cattle epidemic of recent importation, and no doubt you all remember the days of its first appearance, ten years ago, and of its recurrence during the time of the war. This disease took us absolutely unawares; it was in our midst without the slightest warning and before we were able to take proper precautions. The tactics adopted in Europe for the eradication of rinderpest were those of killing all infected and in-contact animals, but when these principles were applied in our country, the many varied conditions hindered us, and they had to be abandoned as futile. People were inclined to say that the policy of killing infected herds was not scientific but savage, yet, in the absence of proper knowledge or other prophylactic measures, drastic diseases required drastic remedies, and the "stamping out" policy would have led us to success if it had been strictly followed from the very commencement of the outbreak. For over a year, however, we were able to keep the disease in check, and, meanwhile, other suitable methods of combating the plague were found consisting of the immunisation of the majority of the cattle in South Africa, with the result that the disease, of necessity, had to die out. To-day, we are no longer afraid of the once-dreaded rinderpest, and if it should appear again we should be able to deal with it promptly and effectively, but, at the same time, this knowledge will not allow of any laxity; and the principle of preventing a further introduction of the disease must still be the guiding one of our policy.

A third cattle pest, imported at the beginning of the seventies into Natal, was redwater, which played havoc in the Cape about ten years later, spreading finally to the Transvaal, and is now present almost all over South Africa. In this case the preventive measures adopted in the Cape Colony failed; all regulations of quarantining cattle had to be abandoned for the simple reasons that the knowledge of the etiology of the disease was practically nil, and, above all, the immune animal proved to be the principal carrier of the disease —a fact beyond the comprehension of all, and, at that time, without precedent in the whole range of Veterinary Science. Therefore, redwater had to run its own course unchecked; it was fortunate that young animals did not readily die from redwater, but, in the course of time, it was natural that new generations of cattle would acquire immunity against the disease, so that, to-day, the greater part of the South African cattle are immune.

* * * *

A fourth imported cattle plague is East Coast fever, which is somewhat allied with the previous disease. Since the introducton of redwater into South Africa full knowledge was acquired as to its cause and propagation, consequently we were not quite helpless in our endeavours to check East Coast fever when it appeared. From analogy with redwater we concluded that it must be spread somewhat in the same way, and, in a comparatively short space of time, were able to recognise the cause, and, therefore, to devise measures of prevention.

The fifth cattle disease which appeared in recent times was "foot and mouth disease," in 1893, entering from the north, just as rinderpest had done, and sweeping through the whole length of this sub-continent; but, in this case, it was very fortunate that the pest was of a mild character, so that the farmer talked of it more in the nature of an unpleasant incident than as a serious trouble.

The last cattle disease was "The three days sickness," but since its appearance was quite ephemeral and caused but little damage, no serious effort to eradicate it was required.

Referring to maladies of small stock, we recall one which played great havoc amongst Angora goats in the early eighties, in the Cape Colony, namely, "contagious pleuro-pneumonia." Fortunately, the grave nature of the disease was recognised, and most stringent steps were at once taken, so that it was soon completely extirpated.

Scab can hardly be considered an imported disease to South Africa; its eradication has so far failed, notwithstanding many attempts to that end. The history of scab stands as a vivid lesson of how a pest can be preserved when the laws of hygiene and prophylaxis are made a subject of party politics.

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Of the contagious diseases of equines introduced into South Africa, that of glanders is the most important. Judging by the fact that "glanders" and "new sickness" (strangles) are confused by the

layman, it is not mere surmise to say that glanders and new sickness must have been imported to South Africa about the same time. The difference between the two diseases is that, whereas "strangles" is curable, and caused by a streptococcus, glanders is not, the responsible agent being a bacillus. But the symptoms are sometimes so very similar that a layman without any trained experience finds it difficult to make any distinction between the two. In the past the great difficulty in adhering to our policy was to recognise the occult cases, but Science has now given us a valuable and certain diagnosticum in the form of mallein, thereby providing a powerful agent for its final eradication. Rhodesia affords a good example of the way to tackle this plague.

I wish to mention another disease of horses which seems to have been imported to South Africa, and, in certain centres, already causes a considerable amount of damage, viz., osteoporosis. To judge from the history of its propagation it appears to be infectious, so far only existing in certain localities; the primary cause has not yet been ascertained, although several points in connection therewith have recently been cleared up by our Chief Chemist, Mr. Herbert Ingle.

Amongst swine, we know of swine fever as an importation of recent years which could hardly be prevented, since the cause of that malady has only been recognised within the last two years.

This historical review shews that, in the past, South Africa has been the happy hunting ground of various well-known diseases, some of which have established themselves and some have disappeared either of their own accord or through legislative action. We have a few examples indicating that it is possible to promptly eradicate a plague if the proper precautions are taken, while, on the other hand, we have cases showing how a disease can establish itself either when the etiology is not known, as in the case of redwater, or when ineffective measures are applied, as with lung sickness and scab; or, further when two diseases of a similar clinical nature are confused, as with glanders and the new sickness. With the exception of redwater and East Coast fever, to which I shall refer later, the above-mentioned diseases are characteristic in as far as they are of a purely contagious nature. That is to say, the disease is attached to an animal, and the germ—or the micro-organism—finds it difficult to multiply or propagate outside the body. It is, therefore, quite feasible that, by removing the cause, or, in other words, the sick animal, the disease must disappear. This can be done either by curing or by destroying. In some cases a curative treatment is either impossible or the time occupied would be too long, and the convalescent animal would form a constant source of infection; therefore, from an economical and prophylactical point of view, its destruction is cheaper. This principle, known as "stamping out," was laid down by the first Congress of Veterinary Surgeons, held about forty years ago, and by it Europe

has been liberated from almost all contagious diseases. A modern method which amounts to the same thing is to make the animal unfit for the development of a malady by rendering it immune. This has been applied with success to rinderpest, and can be equally applied to pleuro-pneumonia. It, therefore, follows that, from a judicious application of the various principles, prevention or eradication is possible. In the case of a contagious disease, it is the duty of the State to protect its subjects, and when the infection can only be checked by killing sick or contact animals, then it becomes necessary to compensate the proprietor, whilst, on the other hand, it is the duty of the people to contribute towards this compensation. This principle is one of economic politics recognised in all civilised States, and frequently enforced.

Again referring to the purely contagious diseases, one question arises : "Do others exist of a similar contagious nature, not yet known in Africa, and which might be introduced?" The answer is emphatically "Yes," and we may say that one of them, namely, tuberculosis, is already present. Tuberculosis runs a chronic course, and, therefore, the damage is not immediately apparent ; consequently it has frequently been argued that the conditions of South Africa are not favourable for its propagation, otherwise it would be more prevalent than it is at the present time. But, on reference to the conditions in Madagascar, where tuberculosis is also known, to New Zealand and Australia, where it plays great havoc, we must admit that this disease constitutes a menace to the South African stock-owner. It has already established itself in South Africa, not so much amongst the ordinary cattle—the dairy cows in the various Colonies are, as yet, slightly infected—but, sooner or later, it is bound to extend to the other cattle. There is no cure for tuberculosis in the ordinary sense of the word, but here again Science has given us a diagnostic by which we are able to recognise the occult cases, and, accordingly, to detect an outbreak and to judge of its extension so that we are sufficiently armed for its stamping out. Tuberculosis should be attacked with all vigour ; at present it is comparatively easy to deal with, and proper supervision will check its spread.

Another purely contagious disease is sheep pox, not yet known in South Africa, and it is rather a miracle that it did not appear when there was an indiscriminate importation of stock into South Africa, but still it is quite possible that one day we shall hear of it in the neighbourhood, if not in our own country. There are several other contagious diseases of a milder nature to which I shall not refer in detail. As already indicated, the plagues mentioned are of universal occurrence and are not connected with any particular climatic or telluric conditions which favour their development.

The second group, including tropical and sub-tropical diseases, are caused by parasites which, in their life-cycle, depend upon the presence of a suitable host. South Africa offers to a great extent the conditions of a sub-tropical country, and therefore we must expect the introduction of diseases existing in similar countries. The point at issue is, therefore, the presence of a suitable host which is dependent upon the climatic conditions favouring its existence and development; accordingly, when we speak of climatic conditions suitable for tropical diseases, we mean that a host is present, all that is required is the introduction of the disease in order to infect that host. The tropical diseases, which are of economical importance, and which I propose to consider, are all blood diseases caused by micro-organisms which are either so small that no microscope will detect them, or that they cannot be cultivated by artificial means from the blood of sick animals.

The second group is caused by visible micro-organisms belonging to the protozoa: that is the lowest class in the animal kingdom. All these parasites either live in the blood corpuscles or in the blood plasma. It is probable that they destroy the former by some chemical action which has a toxic effect on the system and leads to rapid or chronic ailments. The visible micro-organisms belong to two classes, namely (1) piroplasms, and (2) trypanosomes. The former are cell parasites and live in the corpuscles, the latter are free parasites and are found swimming in the blood plasma. There is a further peculiarity amongst these classes of parasites, namely, the trypanosomes are carried by flies and the piroplasms by ticks. The tropical diseases caused by invisible micro-organisms are found in these two groups, and I now propose to deal with them seriatim.

* * * *

Firstly, with the diseases carried by flies. The classical example of this group is nagana, or the tsetse fly disease, which was the first trypanosomiasis to be studied in Africa, and its cycle has been thoroughly elucidated. For many years it was known that the tsetse fly was responsible, and also that the fly was usually found in connection with big game. Livingstone, who was one of the first investigators, thought that a poison injected into the body by the fly caused nagana. Later, this poison was identified by Mr. Bruce to be a trypanosome, in whose honour the name of trypanosoma brucei was given. The fact of the parasitic nature once ascertained it became evident that the fly could not be the reproducer of the parasite, and that the fly had to obtain the infection from elsewhere. In other words that the fly acted as the host of the parasite. Guided by the experience that the fly was found in connection with big game, Bruce examined the blood of the latter, and, although he did not find trypanosomes, yet he was able to reproduce the disease by the inoculation of such blood into dogs, proving that the game harboured

the parasite. It is very seldom that the micro-organisms are visible in the blood of infected game, but, notwithstanding their scarcity, subsequent inoculations prove their presence. The fly feeds on game and is infected with trypanosomes which undergo sexual multiplication in its body, and are subsequently injected into cattle. Thus, under the ordinary conditions, the game and the fly are necessary for the completion of the life-cycle of the parasite. The game acquires immunity, due to the survival of the fittest, but when the parasite gains access to susceptible domesticated animals it finds no resistance, develops *ad infinitum*, and finally kills the animal. The carrier of the parasite, which, in the case of nagana is the fly, is called the reservoir of the virus. We shall utilise this expression later in the explanation of other tropical diseases.

In Africa alone, for the last ten years, many different sicknesses have been found due to the presence of trypanosomes. For instance, in Gambia, of West Africa, horses suffer from the trypanosoma diomorphon ; in the Cameroons a disease is described due to trypanosoma vivax ; in the Congo another one is found under the name of trypanosoma congolense ; trypanosoma nanum is found on the Nile ; the "Sleeping Sickness Commission" in Uganda discovered trypanosomes in cattle and mules, "sleeping sickness" itself being caused by one. In Somaliland a disease exists called aino ; in Algeria is one known as el dabab ; mbori is present in the French Soudan ; in other parts of North Africa is the soumaya, and, very probably, there are many more. They attack all domesticated animals, including camels, and, in most instances, the presence of these trypanosomiases are identified with the presence of a particular fly belonging either to the genus glossina or tsetse fly, to the tabanas or gad flies, or to the stomaxis or biting flies. Likely enough, on closer investigation, it will be seen that one or the other trypanosome is identical with the trypanosoma brucei, and will, therefore, be limited to such parts of the country where the fly finds its necessary reservoir. Others are rather different, and can by no means be identified with the presence of specific glossina flies.

Furthermore, some of these trypanosomiases have been recognised as being due to a specific trypanosome whose presence was first noticed in India, and, in honour of its discoverer, is now called trypanosoma evansi. This trypanosome causes that most devastating disease called surra, which, in its native country, attacks all animals, including elephants. It is not yet known by which specific fly it is carried, although several tropical tabanidæ are accused, but actual proof is still wanting. Surra has already had a suggestive history. It was exported from India to the Dutch East Indies and Mauritius by means of slaughter cattle. In the former country, fortunately, it was recognised,

and, by prompt destruction of infected cattle, all danger was averted; but, in Mauritius, it was not recognised for a considerable time, with the result that practically the whole of the stock of that island was annihilated. It is not yet certain whether the disease in the north of Africa is indigenous, or whether it was introduced, but the fact remains that camels imported from India for the purpose of transport in native wars, carried surra with them, and its presence in Somaliland may also be traced to this source. Surra caused us some slight uneasiness a few years ago when camels from Somaliland were imported into this country. Happily we recognised it early enough to take most prompt measures by destroying these transport animals and thereby removing the danger. Outside Africa we know of another trypanosome in the tropical parts of South America under the name of mal de caderas, meaning sickness of the hip, attacking horses, but which can be transmitted by inoculation to almost any animal. The responsible host has not yet been found, but another animal called "carpinchos," a water hog, seems to play the rôle of the reservoir of this virus. As already stated, all the foregoing trypanosomes require a host for their development, and the reservoir of the virus is either the sick or an immune animal as yet unknown. We know of one exception where the trypanosome is propagated without the medium of a host, namely, the trypanosome of a horse disease known as dourine, or the syphilis of the horse, which is exclusively propagated through the act of the coitus from stallion to mare, and from mare back again to another stallion. The presence of a trypanosome indicates that probably, at one time, the disease was also insect-borne, but the trypanosome has now adapted itself to this mode of transmission exclusively, and the fly is no longer required. At the present time dourine exists in North Africa and in India. At one time it was known in Europe, where, by the destruction of infected animals it has now been eradicated.

From this list of the various trypanosomiases which are at present known in Africa, you can gather to what extent this portion of the sub-continent is free of these diseases. Moreover, I must remind you that South Africa has all the conditions required for the development of most of these diseases. Indeed, it is possible that we have one or other fly which acts as the host in the transmission of any one of those parasites, and all that is needed to spread the disease is the importation of a single sick animal.

The second group of tropical diseases are piroplasmoses, which require a tick for their development. In South Africa at the present time we have the following piroplasmoses: redwater, East Coast fever and one form of gall sickness in cattle; in equines, biliary fever, and in dogs, a sickness of a similar name; in sheep we do not

yet know of any. In all cases we have traced the intermediary host in the shape of a tick, but it must be clearly understood that the tick as such is unable to give rise to a disease, but requires virus from some reservoir, which may be either a sick or immune animal. The blue, brown and red ticks were present in South Africa for years previous to the introduction of redwater, or African Coast fever, but once the reservoir was imported the disease followed, and, in the case of redwater, all the conditions were favourable for its establishment. Piroplasmoses can be divided into two groups, a distinction which is very important—the first group includes redwater (piroplasma bigeminum), of which not only the sick, but the immune, animal as well is the carrier of the disease. It seems somewhat incredible that an animal which has recovered from an attack of a disease should retain the parasite in its blood, but yet it is so, and we now have a parallel in the case of immune game in the tsetse fly disease. The importation of redwater in the first instance, and its subsequent spread almost over the whole of the sub-continent was principally due to the immune animal. To this group also belong one form of gall sickness of cattle, the biliary fever of horses and of dogs. The second group consists of the type of East Coast fever (piroplasma parvum). In this disease the sick, and not the immune animal harbours the parasite, and, therefore, the sick animal is exclusively the reservoir of the virus.

* * * *

Certainly South Africa has a very fair share of piroplasmoses, but we are not the only country which has these diseases. North America has its Texas fever, South America its trystezza, which are both identical to our redwater ; indeed, redwater is found all over Africa, in Madagascar, India, China, Queensland, and in many islands, and is the most common pest in the warm countries of the globe. Europe contains a similar disease reaching as far north as Lapland, and which is also transmitted by a tick. Experiments have proved this to be a different species of piroplasmoses. In the Trans-Caucasus a new species of piroplasmosis has been described, called piroplasma annulatum, which, at one time, was identified with our East Coast fever, although their duality has now been established. A similar piroplasmosis is known in Egypt and in Tunis ; probably the whole of the north of Africa is infected. Recently, diseases due to similar piroplasms have been described in West Africa, India, Japan, so that it is quite likely that the area covered by the piroplasma bigeminum is also covered by other piroplasms, and this theory is all the more feasible in view of the suitable climatic conditions. As already stated, no piroplasmosis has yet been found amongst small stock of South Africa, but one exists in Roumania on the shores of the River Danube, and is also transmitted by a tick. I have explained, in connection with diseases carried by flies, that the conditions necessary for their propagation are present in our climate, therefore it is not surprising, that within recent years, two new ones could establish

themselves. Indeed, the piroplasmoses offer us the best example how they can find suitable conditions once they are introduced. We may ask the question : "Why have we apparently escaped the introduction of several diseases existing in Africa and in other parts of the world?" To some extent we have not completely escaped, yet the non-introduction of the majority has been our good fortune. You must not forget that Africa is comparatively a new country, and not yet thoroughly stocked, but, in such cases where commercial intercourse has ensued, it has been almost immediately followed by the introduction of a new disease. But civilisation marches rapidly in South Africa, barriers are removed, communications facilitated, commerce develops, and, ere long, the whole Continent will be intersected by railways, when the conditions will be present for the introduction of these various pests, and it is for this time that we have to prepare. Accordingly, in order to exclude their introduction, we must now arrange our legislation and educate our people so that preventive measures can be carried out by an efficient staff. This, of course, equally holds good with the importation from oversea. It is one of our duties to study the conditions under which diseases develop in other countries in order to know whether they could establish themselves if, perchance, they should be introduced into South Africa. But it is just as well to be absolutely on the safe side by shutting the door against the importation of any animals from such countries wherein we know that strict veterinary supervision is not exercised.

I will now refer to the indigenous diseases of horse sickness in horses and mules, blue tongue in sheep, and heartwater in sheep and cattle. So far as we know they are exclusively African sicknesses, horse sickness being prevalent all along the shores of the East Coast from the Red Sea, and also on certain parts of the West Coast. We know how heartwater is caused by an invisible micro-organism which we are unable to cultivate. It is transmitted by ticks, and we know further that it is only a sick animal which acts as the reservoir, the immune animal not being a carrier. The micro-organism of horse sickness and blue tongue are also unknown, as they are too small to be recognised, and proof of this is given by the fact that the vehicle of the virus, namely, the blood of a sick animal, may be passed through the finest filter which retains any visible micro-organism, so that it is almost reasonable to say that it will never be seen. In these two maladies the immune animal does not retain the infection, and, accordingly, it does not act as a reservoir of the virus. You are probably aware that we have formed a theory that the virus of horse sickness and blue tongue are carried by insects. The history of their propagation, all the experimental facts and the observations in practice, support this conception. Certainly, there are many objections against this, but these are more of a general than of a specific nature, and

do not bear critical investigation. I hope that future researches will bring the actual proof as in the case of fly and tick diseases.

Now I will deal with a fourth group of diseases, namely, those caused by internal parasites, and which are due to various species of worms. Internal parasites are scattered all over the world, but South Africa offers equally good conditions for their development such as are found in any other part, due to the tellurical and hydrographical conditions of the country, especially to the distinct seasons characterised by the presence or absence of rain which regulates their prevalency. We are familiar with the life-cycle of some of these parasites, but the majority are unknown as yet. In some cases a host is exclusively required for their development, others pass part of their life-cycle outside the animal ; some again require two hosts, and lastly, even a third host is necessary before the life-cycle is completed. To combat these diseases by legislation is almost futile ; all we can do is to find such remedies as will remove the parasite out of the internal organs wherever such a procedure is possible ; but in the majority of parasites this is not possible, and, therefore, we have to take our hygienic measures with the view of excluding the parasite from entering the system of the animal. It is not only the veterinary surgeon, but also the farmer, who should make himself thoroughly acquainted with parasitology, and the latter should make himself familiar with all our knowledge of these parasites and so be able to adapt his methods of breeding to the life-cycle of these parasites, taking into consideration the tellurical conditions of his district, of his farm in particular, and all the climatic changes of the particular year. There are many parasites in South Africa, not yet described, of which we do not even know the name, much less anything regarding their life-cycle ; but it is the duty of scientific men to make provision for these studies, and, on the other hand, it is the duty of the farmer to assist with his observations, and, if necessary, even with material. After enumerating the many troubles existing in Africa and in other parts of the world, and of which I have expressed the opinion that for one or the other reason they might be imported, and once introduced they might establish themselves, as already many diseases have done, it now remains to be seen (1) what can be done to prevent their introduction, (2) what can we do with those which have established themselves already, and (3) what must we do with the diseases which are indigenous to South Africa, and of whose occurrence we consider to be more or less inevitable.

With regard to the first point, I wish to quote the recommendation passed by the Tropical Section of the International Conference of Veterinary Surgeons in Budapesth two years ago, and at which

the writer was present. It was : That the study of tropical diseases in the various parts of the world should be undertaken by the respective Governments, and should be carried out under conditions which are most favourable for their development and their propagation; that in such countries where no legislation exists this defect should be remedied and carried out by a competent staff. The safest guard against the introduction of a disease is a well-established Veterinary Department supported by a sympathetic Government, stringent regulations executed thoroughly, and, above all, the exclusion of stock from such countries of which we are ignorant concerning their diseases.

The second point, how to prevent and how to eradicate the established diseases, deserves fuller consideration. Here we have to ask ourselves is it possible to completely eradicate a disease, that is to say, to stamp it out so that no danger remains for the remaining healthy cattle, or for cattle imported from healthy countries. From this point we may divide the established diseases into the following classes : (1) those which require a reservoir—other than stock—and a host for their propagation ; (2) those in which the immune animal forms the reservoir ; and (3) those where the sick animal is exclusively the reservoir of the virus. To the first group probably belong nearly all the fly diseases, headed by nagana, and the history of this disease furnished us with an example where the disappearance of the game was followed by the disappearance of the fly and the consequent extermination of the disease. In this particular case the joint disappearance of the fly and of the trypanosomiasis is a mere coincidence ; the fly need not necessarily disappear as long as the reservoir is destroyed. For the eradication of the disease, either the destruction of the reservoir or of the host would suffice, and as it is hardly feasible to destroy the carrying insects, there only remains one alternative. From this point of view we have to look at horse sickness and blue tongue : we consider them as insect-borne diseases ; but the immune animal is not the reservoir of the virus, and we believe that the propagator is present everywhere in the shape of an animal not yet known to us. The natural conditions under which we observe the increase and propagation of the two maladies would foster, not so much the development of the animal which acts as the reservoir, but of the intermediate carrier, or the insects, so that the chances of an epidemic are proportionate to the increase of these insects. For the complete eradication of these diseases it will be necessary to destroy the reservoir, but, at the present time, we do not know of the animal which acts as such. It will be a duty of scientists to find it out, and investigations may be helped by farmers who, from their observations, may be able to give information in the way indicated. We have every reason to hope that from the analogy with the tsetse fly disease, once we know the hosts we can perhaps destroy them and thus eradicate horse sickness from South Africa. In the meantime we have to use other ways and means to combat horse sickness and

blue tongue. We utilise the observations that an animal which has passed through either of these diseases acquired immunity, and our object was, therefore, to render all exposed animals immune. You know that we have succeeded with horse sickness in mules ; we have not yet succeeded with horses because the question of immunity in horses is more complex than the same question with regard to mules ; under the influence of our method of inoculation the mule passes through the disease, probably assisted by some inheritance from his sire, the donkey, and which is missing in the horse. But we have noted in our experiments that although a horse is immune against horse sickness, having shewn all the lesions of dikkop, yet we can break this immunity a second or even a third time, in other words, we have not one strain of virus which protects against the whole of South Africa, we have several strains, and this is a matter with which farmers have been familiar for many years. We are endeavouring to give immunity against as many strains as possible, and by combining them so that the horse immunised by us will be better protected against horse sickness than the one which has contracted the disease in the natural way. We have not yet completely solved this problem, but we are well on the road to success. It must not be forgotten, however, that the inoculation of horses against horse sickness does not mean eradication of the disease. It merely means prevention. Horse sickness will not completely disappear from South Africa until we have destroyed the reservoir, and I consider this object to be far more important than that of immunising animals.

The second group comprise the diseases in which the immune animal is the principal carrier of the reservoir of the virus. To this group probably belong some of the fly diseases and most of the piroplasmoses, in particular those of the type of piroplasma bigeminum of ordinary redwater. The ox which is immune against redwater is usually also immune against one form of gall sickness caused by a piroplasm ; the horse which is immune to equine piroplasmosis, and the dog immune against canine piroplasmosis are all constant carriers of the disease. In this group the tick sucks blood from the immune animal, and with it the parasite ; the parasites are communicated to the healthy animals by one of the various stages in the cycle of the tick's development, varying in the different diseases. For instance, the ordinary redwater is taken by the blue female tick ; the parasite passes through the egg ; about 6,000 eggs are laid by a female tick out of which the larvæ develop, and it is very possible that each individual larva is able to communicate the disease. Hence the constant infection of our pastures by these ticks, which retain the infection for the many months they live, means that it is not possible that the farm will ever be free of redwater as long as these ticks and immune cattle are present. The conditions of the greater part of South Africa prevent cattle from any country where there is no

immunity against redwater being introduced with safety, and if we want to introduce imported cattle we must render them immune against redwater. In the case of biliary fever of horses, the red tick carries the infection; the nymphæ infect themselves and propagate the disease as adults. These red ticks are not so numerous as the blue ticks, and, therefore, there is a greater chance for an imported horse to run for some time in an exposed area before contracting the disease, than for a susceptible cow to contract redwater. In biliary fever of the dog the mode of infection is still more complex since the infection passes through the infected female into the larvæ and nymphæ, and is not communicated until the adult stage of the tick is reached.

From an etiological point of view two ways are open in order to eradicate piroplasmoses, namely, either to destroy all the immune animals or to kill all the ticks; but, as you can see, these alternatives are equally unfeasible. Indeed, the destruction of ticks on one farm and not on another would be short-sighted policy, although I do not mean to say that I am not advocating the reduction of the number of ticks where the tick, as such, constitutes a trouble, but the complete destruction of ticks on a farm and not on another would mean breeding cattle and horses not immune against the above-mentioned diseases, and the farmer who would carry out this eradication in the strict sense of the word would very soon be the loser. In stock-breeding of South Africa these diseases do not trouble us to a very great extent, except in cases where through some other ailment the immunity is broken down and the parasites present in the blood have a chance to develop; the disease then appears quite as a secondary complication. These maladies are, however, a serious trouble when we import horses, cattle and dogs: as long as these animals are kept in the stable they are comparatively safe, but, directly they are exposed on a pasture they contract the disease, and the only practical way out of the difficulty is to immunise these imported animals against the disease. This is partially possible with redwater; the inoculation is safe as far as South African animals are concerned, but it is not yet safe for imported cattle as the mortality is too high; we have been able to ascertain one of the reasons for this mortality by finding out that immune animals harbour not one, but two, parasites in their blood, so that by inoculating the blood of an immune animal we inoculate two diseases, and although both may be mild when appearing individually, yet, collectively, they may be responsible for deaths. With regard to equine piroplasmosis, we have succeeded with the inoculation, and our experiments with horses, mules and donkeys are on a sufficiently large scale to recommend the introduction into practice. The immunity, however, obtained by this inoculation is more of an initial immunity which will improve when the animals are exposed to natural infection. It will reduce the percentage of risk, but natural infection from ticks may perhaps cause a breakdown in some instances. Concerning biliary fever in dogs, I can hold out

some hopes of eventually being successful in finding a preventive inoculation.

The third group of diseases, where the reservoir is formed by the sick animal, consist of the contagious diseases, including the indirect contagious East Coast fever and heartwater ; these latter two are exclusively tropical diseases. The sick animal propagates and harbours the parasite, therefore the removal of the sick animal means destruction of the reservoir and eradication of the disease. The animal itself comes into consideration as the main propagator. The destruction of the virus would not be necessary if the animal could be rendered immune. We have made use of this fact in connection with rinderpest and lung sickness ; immunity in rinderpest certainly means eradication of the disease because, at the same time, the virus is of such a fragile nature that it does not live outside the body ; in pleuro-pneumonia it is slightly complicated inasmuch as apparently healthy animals may carry the disease and form a source of infection. It must, however, be understood that there is no comparison between the immune animal of pleuro-pneumonia and the immune animal of redwater ; in the latter case it is the immune animal under all conditions which carries the disease, and, in the former, it is practically a chronic sick animal which, to all outside appearances, is healthy. This is probably one of the reasons why we have not succeeded in completely eradicating pleuro-pneumonia from South Africa, but, as mentioned earlier, there should not be any difficulty in this respect in the future.

Of the two indirect contagious diseases, East Coast fever and heartwater, the possibility of their eradication remains in the destruction of the sick animal in the first instance, and in freeing such ticks as are the carriers in the second instance. These precautions are possible, and actually enforced in connection with the present measures utilised, as when we leave an area devoid of infected animals, the ticks will feed on non-susceptible animals, free themselves of the infection or, in time, will die out. The fact has been established that fourteen months after the death of the sick animal, the area becomes clean. With heartwater the same could be applied, but, in this case, the bont tick, which is the carrier of the disease, is endowed with considerable longevity. The procedure of clearing an area of heartwater may be somewhat accelerated by freely dipping the animals. For this purpose immune cattle would be sent into the area, become infected with ticks which, by dipping, would be destroyed, and, finally, the area cleared. The only practical solution of any assistance would be an inoculation to render the animal immune, but this problem has not yet been solved, although I am confident that such an inoculation is possible.

The last group of the mentioned diseases render themselves amenable to legislature, and it is the duty of the State to step in and enforce such legislation where the disease is of economical importance. Fortunately, the several Colonies of South Africa possess adequate legislative measures which, if carried out by the various authorities strictly according to the sense in which they were drafted, would certainly help us to get rid of them all.

In the foregoing notes I have not mentioned the eradication of anthrax, quarter evil and scab. These can, to a certain extent, be dealt with by legislation. Anthrax and quarter evil behave very much in a similar way; the micro-organisms which cause them cannot be considered as obligatory parasites depending only on an animal. For, outside the animal, they take the resting form of a spore which enables them to live for some years. Yet the sick animal is the main source of propagation, and its destruction is necessary in the strictest sense of the word by burning or burying. Immunity by means of inoculation renders great assistance. In scab the parasite itself has to be directly attacked, the sick animal, the main cause of the disease, cannot be rendered immune, but it can be cured. How this should be done is a special subject.

Reviewing all these diseases we come to the conclusion that they are of such a manifold nature and offer so many variations that it is impossible for the ordinary farmer to aid himself. He requires the assistance of trained men and of scientists whose duties are to study these diseases, and to spread such knowledge amongst the farming community. Progress and success then depend on the individual farmer if he has faith in the scientists and is able to make use of their knowledge. The duty of the State is to provide the facilities and to make provision for these investigations.

South Africa in the past has had the services of a man whose death unfortunately recently occurred, and whose name will be handed down to posterity; but I am afraid those living have hardly rendered him the thanks he was entitled to by his imperishable work. I refer to our late colleague, Dr. Hutcheon of the Cape Colony, whom we will always look upon as the pioneer of Veterinary Science in South Africa, and who, by his hard work and splendid services, has created an ideal for the members of his profession to emulate.

The various South African Colonies possess establishments for the purposes of investigations on the lines indicated. Cape Colony was the first in the field, and Natal followed. The Transvaal has, in the past, supported scientific work to a great extent, although till now the buildings were not equal to our needs. However, the late Crown Colony Government of this State saw the necessity of enlarging the premises of our Veterinary Bacteriological Laboratory, and

Plate 17.

Government Veterinary Surgeons.

(Transvaal Department of Agriculture.)

Reading from left to right:—
Back row—G. W. Lee; F. Lindsay.
Second row—R. S. Garraway; J. Walker; J. I. Edgar; W. G. Evans; G. May.; H. M. Webb; S. I. Johnston.
Third row—J. H. Bell; Dr. Walter Frei; Dr. Theiler, C.M.G.; C. E. Gray, P.V.S.; J. M. Christy, A.P.V.S.; T. H. Dale; J. Chalmers.
Front row—H. X. Turnbull; J. P. Dunphy; F. J. Dunning.

Responsible Government, being also in keen sympathy with the idea, accorded their hearty support—sanctioning the expenditure of over £50,000 for the purpose—and, at the present time, the work is progressing so well that in a few months we hope to take up our abode at Onderstepoort, a few miles outside the Capital. We are building a laboratory sufficiently large, not only for the requirements of this Colony, but also for the study of these great problems of South Africa, not only for the present time, but also with a view to the requirements of the future. And, being convinced that the salvation of South Africa in eliminating disease will ultimately remain with the sons of the present generation, we have made provision to educate them, hoping that, in the near future, the new Government Institution will train our sons in Veterinary Science, and they in turn will be sent forth to assist you in the prevention and eradication of all South African stock diseases.

THE CO-OPERATIVE MOVEMENT IN DENMARK.

By B. Stilling-Andersen,

Superintendent of Co-operation.

CO-OPERATION was first started in Denmark in 1866, and in the following manner. In a certain small town in Denmark called Thisted a clergyman observed that only a very few people attended his church. He, however, was anxious to talk to the people, and, as they would not come to him he went to them; and so every Sunday he arranged to hold meetings down at the harbour with the usual "questions and answers" at the close. Of course these meetings were more or less of a religious nature, but one day a spectator asked the clergyman whether he could not make it possible to produce "our daily bread" a little cheaper. And this is said to be the way in which he started to study the English co-operative history, and found out how a few poor English weavers at Rochdale, in 1844, by each saving up 2d. a week, laid the foundation of the later so famous English Co-operative Societies. Such was the tale that the minister, Mr. Sonne, told the people at Thisted, and thus the first co-operative society was formed in 1866 under the name of the "Thisted Working Men's Society."

The storekeepers, however, soon started a fierce fight against this Society, as they found that they did not make the same profit that they used to out of the poorer classes. However, this only made Mr. Sonne more firm. The working people stood bravely by his side, and the Society soon flourished, while the condition of the working men also greatly improved.

Several societies were then formed, and a few figures will show the progress :—

In the year	1875	we had	95	societies	(members unknown).	
,,	1892	,,	547	,,	with 75,294	members.
,,	1898	,,	837	,,	,, 130,331	,,
,,	1905	,,	995	,,	,, 164,710	,,

In the year 1896, thirty years after the start of the first society, we got a general Central Federation for the whole of the country to represent these co-operative societies, and this Federation now does all the buying for the smaller stores, thus enabling them to sell at the same price as the other shops and still pay a very considerable bonus at the end of the year, besides saving up a big working and reserve capital.

However, although this movement was originally due to the English system adopted at Rochdale, it may be interesting to notice that it was not this early system, but the system of co-operation in the manufacture of produce that has made Danish co-operation so well known abroad, and, at the same time, has brought such large sums of money into the country. This second system was developed quite independently of any other, and may, therefore, be regarded as truly Danish. This the writer can well certify, as his father started the first real co-operative dairy in Denmark, in June, 1882. Before that time we used to produce very bad butter in Denmark, and prices varied a great deal. In fact there was a difference of about 33 per cent. on an average between the butter produced by the farmers and that produced by the big estate owner, because the latter was able to buy machinery and keep a dairy expert which the farmer of course could not afford.

Seeing this Mr. J. Stilling-Andersen and some influential farmers thought it might pay to work the milk at a central factory and then distribute the profit according to the quality and the quantity delivered. The scheme, however, proved very difficult, and it was only due to the hard-up state of the farmers that some did join, but not in sufficient numbers to run a co-operative creamery at a profit. Mr. J. Stilling-Andersen, therefore, had to buy large quantities of milk from farmers in the neighbourhood and enter himself as a supplier, and thus run the risk of paying a fixed price for the milk and taking a price from the dairy subject to the fluctuations of the market. His belief in the co-operative method of producing butter, however, was unshakeable, and he wanted a proper trial at any cost. No State subvention was then granted, and the difficulty of obtaining sufficient money was very great, as only the poorer farmers would join. Moreover, the poorer farmers did not know how to keep their cream, and the first experiments were certainly not encouraging. They had no refrigerators and very little ice, so that the butter would not stiffen. Few farmers cared much whether a little dirt from the cows went along with the milk or whether the milk was still yellow after the calf, nor did they bother about cooling the milk before sending it to the creamery. Furthermore, the dairy was not properly built and several of the staff died from typhus fever, probably caused by the milk getting under the stones of the floor and fermenting, or possibly some of the waste water may have got into the drinking water. Be that as it may, one member after another of the staff died, and at last hands were hardly obtainable, and they had to start to rebuild the dairy. As may be easily imagined, the difficulties in starting the first creamery were tremendous; but it is worth mentioning that the regulations drawn up for that institution, in many cases, still serve in present dairies, which shows that this was really the first co-operative dairy established in Denmark. Because of the difficulty in the birth of the first dairy, scarcely any were started during the next few years, but, from 1887 to 1889, several hundreds were built every year, and it came as a

surprise to many people when a co-operative dairy was awarded a silver medal at the exhibition in Copenhagen in 1888, knowing that it had been working the milk produced by several small farmers. However, to-day, Danish butter occupies the highest place on the world's markets, and a co-operative dairy exhibiting at Paris, in 1900, won a gold medal although its produce was seven days old and had to compete against fresh-made French butter. Taking the average price of Danish butter and the average price of butter produced in other countries, we estimate that the difference on 137,000,000 lbs.—being one year's total shipment (Danish)—is close on one million pounds sterling, or about 1¾d. a lb. more than all other butters. The number of the co-operative dairies is 1,085, and the dairies built represent a capital sum of £1,500,000. They are owned by some 160,000 members, and receive the daily milk from about 900,000 cows out of a total of one million. In 1906, we worked 4,500,000,000 lbs. of milk, and made 176,000,000 lbs. of butter, valued at £9,500,000. On the same basis the first co-operative pork packing house was built in 1887, about the same time that the dairies began to flourish. The start was made as follows: Certain farmers in the west of Denmark used to send their pigs to Germany twice a week, and had to pay weighing expenses and a fee to the stationmaster amounting to 6d. a pig. The Danish farmers, however, are very economical, and they soon complained to the Minister of Agriculture and to the railway company, but all in vain. Then the farmers started to build a co-operative pork factory costing about £12,000, calculating that the savings of the weighing expenses and fees, etc., would pay the interest and sinking fund. Here also the farmers had many difficulties to fight against, and money was hardly obtainable. Besides, the private slaughteries tried to kill the co-operative factories by paying 2s. to 3s. more for a pig, but they had not calculated on the moral feeling of the Danish farmer. Although he could make more money from the private factories, he stubbornly stuck to his co-operative factory, with the result that the co-operative factories gained the championship in the world's market, and were rewarded with a gold medal at the Paris Exhibition of 1900. We have now about thirty-two co-operative pork factories with about 70,000 members, and get as an average about 2d. more per lb. than other countries.

The youngest of our great co-operative produce societies is the Danish Farmers' Co-operative Egg Export Association, which was started in 1895. People in connection with this society had learned by the success of the dairy and pork factory that, first of all, you must look to quality and then to quantity. About the beginning of the eighties we had an export trade of eggs to England amounting to scarcely £100,000 a year. At that period people liked to keep their eggs for some time before placing them on the market when prices were rising, thus giving us a bad reputation on the English market. Therefore, one of the rules of this society is that the nests must be kept clean, and if it is found that the eggs are not collected daily,

and the nests kept properly clean, the member gets fined 10s. Various societies export eggs amounting to the value of about £1,300,000, and calculated to return us about 1¾d. more per dozen than that obtained for the eggs from other countries.

Taking the export in 1901 of produce, we would have got about £2,225,000 less for our produce if we only had obtained the average price paid to other countries. This is entirely due to co-operation. The co-operative movement, too, has proved to be a very effective weapon against capital. At one period, some ten years back, the Danish corn merchants tried to form a big ring, but the farmers immediately started a co-operative seed and corn purchasing society and bought their goods without the medium of the merchants.

This work, however, has not been done without education. We soon found that it was necessary to get our peasant properly trained if he were to take over the conduct of this big machinery, and so several new agricultural colleges were founded. The following are some of the principal, and to the first two dairy teaching has been added to the other instruction :—

Dalum Agricultural School	founded in	1886	with	80	scholars.
Ladelund	,, ,,	,,	1879	,, 84	,,
Tune	,, ,,	,,	1867	,, 70	,,
Karehave	,, ,,	,,	1903	,, 81	,,

We have now about sixteen colleges scattered over the country. The public high schools with agricultural courses number nearly thirty, and the principal is the Hong Public High School, founded in 1866 with 70 scholars. The ordinary public high schools, to the number of fifty, have proved of enormous value, as they take in both girls and boys, and people from the country and also from the town, thus creating a more friendly feeling between the town and country folk ; several of the present Danish Ministers have passed through one or other of these schools. The best known is Askov, founded in 1865 with 139 pupils. There are nine male teachers and six female teachers, and, amongst them, some of our most able men in Denmark. There are also some schools of domestic science for girls, with agricultural courses.

The year is divided into two semesters—winter and summer—and the fee is very moderate, which has proved most satisfactory, as it encourages more people to frequent them. In fact, I think one will hardly find a farmer in Denmark who has not studied in one of these schools for at least a semester. Having gained sufficient ability through their school training, the farmers, naturally, were able to increase the number and variety of co-operative societies, and few, indeed, are the things which we have not been able to turn into co-operation. In Denmark our farmers have learned that it pays to co-operate and to ceaselessly strive to adopt the best methods, for only by continual and strenuous effort can we hope to improve our agricultural industry, and, at the same, uphold our reputation in the markets of the world.

THE CHEMICAL SECTION.

SOME REPRESENTATIVE SOILS.

By Herbert Ingle, B.Sc., F.I.C.

A.—Springbok Flats.

By the courtesy of the Agrostologist and Botanist, we have recently had the opportunity of examining some soils from the Experiment Station on the Springbok Flats, and as the samples are thought to be typical of the soils occurring over miles of this large district, the results of our examination may be of interest.

The samples were thus described :—

No. 1.—The common red sandy loam. This soil is considered to be relatively poor, and not to be capable of yielding good crops of mealies after three years. It occupies the higher and drier portion of the slight undulations.

No. 2.—"Black turf," occurring in the lower and wetter portions of the Flats, though not necessarily in vleis, and covering many miles of almost level land. This type is considered very rich, and it is said that patches have been cultivated by Kaffirs and produced good crops of mealies and Kaffir corn for 30 successive years. In wet weather this soil is very soft and boggy, and, in dry weather, bakes hard and cracks badly. It is, therefore, somewhat difficult to cultivate.

No. 3.—"Chocolate soil," found chiefly where the red and black soils merge. In general characters it is usually regarded as intermediate between the two preceding types.

No. 4.—From "kaalplaats," *i.e.*, bare places, occurring here and there and thought to be possibly the sites of old Kaffir stadts, thus packed and trodden very hard. This was also of a chocolate colour.

The above samples were collected by Mr. Burtt-Davy along the boundary between the farms "Ludlow" and "Woburn," in October, 1907.

Chemical Composition.

The following are the results obtained by analysis :—

	No. 1.	No. 2.	No. 3.	No. 4.
Stones retained by 3 mm. sieve	none.	none.	0.12	2.17
The fine soil contained :—				
Moisture	5.21	8.85	3.29	3.99
*Loss on ignition (organic matter etc.)	8.20	10.88	8.61	7.51
Insoluble matter (sand etc.)	68.46	60.20	70.77	72.52
Iron oxide and alumina ..	17.44	14.19	15.65	13.60
Lime	0.22	4.43	0.62	1.15
Magnesia	0.26	1.03	0.42	0.58
Potash	0.45	0.57	0.72	0.63
Phosphorus pentoxide ..	0.06	0.06	0.05	0.20
	100.30	100.21	100.13	100.18
*Containing nitrogen ..	0.132	0.127	0.123	0.164
"Available" potash ..	0.0345	0.0081	0.0339	0.0644
,, phosphorus pentoxide ..	0.0018	0.0095	0.0036	0.0988

The figures show all the soils to be well supplied with nitrogen, potash and lime, though, with the exception of No. 4, somewhat low in total phosphates.

No. 1. The *red soil* is unusually high in nitrogen content as compared with the majority of red soils in this Colony.

It is well supplied with potash in a very available condition, but its phosphoric acid is evidently locked up in a state of combination from which plants can extract it with difficulty. I have little doubt, therefore, that the fertility of this soil is limited by its lack of available phosphates, and that if this deficiency were made good the soil would be able to bear excellent crops under suitable climatic conditions.

Probably the most rapid response would be made to an application of, say, 200 lbs. of good white lime followed in a week or so by 200 lbs. of superphosphate per acre.

A cheaper (though not so rapid in its effects) treatment would be an application of, say, 200 lbs. of basic slag per acre put on some time before sowing or planting.

No. 2. The "*black turf*" shows the presence of a large amount of calcium carbonate, which is so often a feature of the black soils of this Colony. It is also rich in potash though in a not very available condition. Its "available" phosphoric acid, though much higher

than that in the red soil, is still somewhat low, and its fertility would probably be increased by an application of superphosphate. But, even in its present condition, the results of its analysis would indicate that it should possess considerable fertility, as, indeed, is said to be the case in practice.

It is somewhat remarkable that this "black turf" should contain less nitrogenous organic matter than the red soil.

Notwithstanding its high content of lime, it is probable that the physical properties of this soil would be improved by a dressing of lime ; its friability and porosity would probably be increased, and its tendency to become sticky and soft when wet, diminished.

No. 3. The "*chocolate soil*," in chemical composition, is intermediate between Nos. 1 and 2 in nearly every constituent excepting total potash in which the sample was unusually rich. Like the others it is weakest in phosphates, and phosphatic manures are all that it should need. With the aid of a little superphosphate, or basic slag, this soil should be capable of yielding good crops.

No. 4. *Chocolate soil from a "kaalplaats*," remarkable for its richness in plant food, especially in phosphates. This soil is potentially of enormous fertility, and it is difficult to account for its barren character unless this be due to the hard and compact state into which it has been trodden.

It contains a small quantity of chlorides, and is perhaps faintly alkaline, but, by repeated ploughing and harrowing, I think it should prove of great fertility. In total phosphoric acid it is one of the richest soils we have yet come across ; it contains a high proportion of nitrogen while its potash is very high both in total quantity and in availability. As soon as it is reduced to proper tilth I should expect this soil to be capable of yielding enormous crops, and it should not require manure of any kind for many years. So rich is it in phosphates that, in cases where the patches of it occur in the neighbourhood of the red soil, it might be worth while to cart it on to the latter and use it as manure, of course in large quantity—several tons to the acre.

The water retaining powers of the four samples were found to be : No. 1, 36.5 per cent. ; No. 2, 39.4 per cent. ; No. 3, 36.2 per cent. ; and No. 4, 34.0 per cent. No. 1 became completely wetted in 1¼ hours, while No. 2 took 20 hours.

It may be of interest to compare the above results with analyses of soils of nominally the same type collected by Mr. Carpenter from the farm "Worthing." These samples were taken in September, 1905, within a few miles of the places from which Mr. Burtt-Davy's were secured. The agreement between the two sets of samples is very satisfactory. Of typical red soil the following are the two analyses :—

	"Worthing." 1905.	"Ludlow." 1907.
Stones removed by 3 mm. sieve ..	0.72	none.
The fine soil contained :—		
Moisture	3.19	5.21
*Loss on ignition (organic matter etc.) ..	9.56	8.20
Insoluble matter (sand etc.)	67.18	68.46
Iron oxide and alumina..	18.90	17.44
Lime	0.62	0.22
Magnesia	0.47	0.26
Potash	0.41	0.45
Phosphorus pentoxide	0.09	0.06
	100.42	100.30
*Containing nitrogen	0.123	0.132
"Available" potash	0.0202	0.0345
,, phosphorus pentoxide ..	0.0028	0.0018

The principal differences in the two analyses are in the proportion of lime and magnesia, but, on the whole, the figures indicate that the soil has very much the same composition in the two samples. The "black turf" and "chocolate" soils show similar agreement with the exception of the total potash in the "black turf," which was phenomenally low in Mr. Carpenter's sample for some unexplained reason. The agreement in the "available" potash, however, is very marked even in this case. We should conclude from the comparison that, on the whole, the three types maintain a fairly constant character over a considerable area.

B.—From Nelspruit.

Three samples were received from Mr. H. L. Hall, of "Riverside," Nelspruit, on the Delagoa Bay Line. The farm is situated about 2½ miles west of Nelspruit Station.

No. 1 was a light grey, very sandy soil which becomes slightly redder below and rests upon decomposed granite. The sample was taken to a depth of about 17 inches. This soil covers a large area.

No. 2 was a red soil of great depth, and is thought to be alluvial : it is from the flat land along the river side. The sample was to the depth of about 18 inches.

No. 3 was a brownish-red soil, apparently homogeneous to a depth of 2 or 3 feet, but the sample consisted of the uppermost 18 inches. This is apparently a river deposit as a few water-worn boulders occur in it. It also borders the river.

None of the samples contained any stones retained by a 3 mm. sieve.

The following are the results of the analyses :—

	No. 1.	No. 2.	No. 3.
Moisture	0.42	3.21	4.91
*Loss on ignition (organic matter etc.)	1.91	4.61	4.40
Insoluble matter (sand etc.)	94.41	81.94	82.69
Iron oxide and alumina	2.75	9.01	7.20
Lime	0.03	0.25	0.23
Magnesia	trace.	0.16	0.08
Potash	0.14	0.19	0.20
Phosphorus pentoxide	0.01	0.06	0.07
	99.67	99.43	99.78
*Containing nitrogen	0.058	0.093	0.095
"Available" potash	0.0088	0.0093	0.0084
„ phosphorus pentoxide ..	0.0010	0.0054	0.0038

No. 1 is thus an excessively sandy soil, very low in organic matter, nitrogen, phosphoric acid and lime. The figures for "available" plant food indicate that it is in urgent need of phosphatic manuring, and though its total potash is only low, its "available" potash shows that, for the present, it is able to supply the needs of most crops with respect to this constituent. Good white lime, say, 300 lbs. per acre, followed after a few days by 100 lbs. of superphosphate and 200 lbs. bone meal, would probably be the best treatment for most crops, while for crops other than leguminosæ and, perhaps, light tobacco, a top dressing of, say, 100 lbs. of nitrate of soda would greatly increase its immediate fertility.

Nos. 2 and 3 are much alike in composition, and are much richer in plant food. Here, too, the most marked deficiency is in phosphoric acid, which, although six times as great in total quantity as in No. 1, is still low in availability. Bone meal and a little superphosphate would probably be the most suitable form in which to apply phosphatic manuring to these soils, as they both contain some calcium carbonate.

Mr. Hall informs me that he had lucerne on No. 3 but the wet season last year (when 59 inches of rain fell) killed the plants. This land yields good crops of vegetables, mealies and beans.

There was a marked difference in water retaining powers of the three soils, No. 1 holding only 19.5 per cent. of its weight of water, while No. 2 held 29 per cent., and No. 3, 30.9 per cent.

C.—Heidelberg District.

Two samples of soil were received from Mr. C. Becker, Fortuna, Heidelberg, taken from a farm (No. 289) near the Zuikerboschrand.

No. 1 was a red soil representing, to the depth of 15 inches, about 20 acres of land on which it is desired to plant lucerne. It was first broken up in March, 1906, and the soil is deep with the ground water at a depth of about 25 feet.

No. 2 was a grey soil from the same farm from land near the Zuikerbosch River, and was taken to a depth of 15 inches. The land is apparently unbroken veld, but is said to have been cultivated and yielded good wheat crops twenty years ago. It is suspected to be "brackish."

Both soils were free from stones retained by a 3 mm. sieve, and in their physical properties appear to be fairly well suited for lucerne cultivation, though No. 2 might possibly be somewhat inclined to cake together on drying after wetting. No appreciable amount of soluble saline matter could be detected in No. 2, so that, if the sample were representative, there is not much danger to be apprehended from "brak."

The composition of the two samples is shown in the following table :—

	No. 1 (Red soil).	No. 2 (Grey soil).
Moisture	0.45	2.22
*Loss on ignition (organic matter etc.) ..	4.35	6.66
Insoluble matter (sand etc.)	87.61	81.69
Iron oxide and alumina	7.02	8.31
Lime	trace.	0.29
Magnesia	0.02	0.26
Potash	0.22	0.26
Phosphorus pentoxide	0.05	0.04
	99.71	99.73
*Containing nitrogen	0.091	0.164
"Available" potash	0.0123	0.0075
,, phosphorus pentoxide ..	0.0028	0.0067

Both soils are well supplied with potash, but deficient in phosphates, while No. 1 is also lacking in lime.

The figures for "available" phosphorus pentoxide indicate that both soils are in need of phosphatic manuring. No. 1, which contains the larger proportion of total phosphorus pentoxide, has the lower amount of "available" phosphates, doubtless due to its containing so much less lime.

For lucerne, the most suitable dressing would be about 300 lbs. per acre of good white lime, followed by 200 lbs. of bone meal on No. 1, and by 100 lbs. of superphosphate on No. 2.

Basic slag, say, 200 lbs. per acre, might be substituted for the above on No. 2, but would probably be slow in its action on No. 1. With the aid of lime and phosphates I think the soils should be well fitted to yield good crops of lucerne after the plants have once been established.

II.]

NOTES FROM THE CHEMICAL LABORATORIES.

1. Brewers' Grains.

A sample of this material was sent by a dairy farmer. It was obtained from a local brewery, and was quite fresh and warm when received.

On analysis the following figures were obtained :—

Moisture	77.64
Ash	1.01
Crude protein	7.26
Soluble carbohydrates	9.66
Ether extract	1.02
Crude fibre	3.41
	100.00

The ash contained :—

Silica	0.42
Lime	0.07
Phosphorus pentoxide	0.34

I give, for the sake of comparison, the averages of German (A) and American (B) analyses of brewers' grains :—

	A (German).	B (American).
Moisture	76.1	75.7
Ash	1.1	1.0
Protein	5.3	5.4
Carbohydrates	12.9	12.5
Ether extract	1.5	1.6
Crude fibre	3.9	3.8
	100.0	100.0

The only noteworthy difference between the local sample and the averages of the German and American analyses is in the amount of protein and soluble carbohydrates.

The Pretoria sample contains about 1½ times as much protein, and only about three-quarters as much soluble carbohydrates.

It is important to remember, however, that the protein, in all cases, is calculated from the total nitrogen present, and is not all proteid or albuminoid, but includes a considerable quantity of the much less valuable nitrogenous substances, amides.

The ash analysis shows that brewers' grains, like all products derived from cereal seeds, contain a much higher proportion of phosphorus pentoxide than of lime. They do not, therefore, lend

themselves to bone nutrition, unless the deficiency of lime is made up by the introduction into the ration of some food rich in lime, *e.g.*, lucerne, cowpeas, etc.

Brewers' grains form a useful addition to the food of dairy cows, provided they are used before they ferment, and if it is remembered that they are very watery, and that only about one-quarter of their weight is solid matter.

2. Bran.

A sample of bran, used in Pretoria and obtained from mills in Bloemfontein, has also been examined.

The sample was somewhat dark-coloured, evidently from red wheat, but quite clean looking and dry. On analysis it yielded the following :—

Moisture	11.02
Ash	6.06
Protein	19.25
Soluble carbohydrates	54.23
Ether extract	2.46
Crude fibre	6.98
	100.00

The ash included :—

Silica	0.07
Potash	2.65
Lime	0.16
Phosphorus pentoxide	2.90

German and American analyses of wheat bran yield on the average :—

	German.	American.
Moisture	13.6	11.9
Ash	5.6	5.8
Protein	13.6	15.4
Carbohydrates	54.9	53.9
Ether extract	3.4	4.0
Crude fibre	8.9	9.0
	100.0	100.0

The Bloemfontein sample is thus distinctly richer in ash and protein, while lower in moisture, ether extract and crude fibre.

The very high ratio of phosphorus pentoxide to lime in the ash (about 100 : 18) is noteworthy, since, although bran, because of its richness in total ash is popularly regarded as being valuable for bone nutrition, the theory which I have recently adduced ("Journal," Vol. V., p. 931) would indicate that it is particularly unsuitable for this

purpose, as, indeed, the prevalence of a bone disease in millers' horses, often fed largely upon bran, confirms. It will be seen that, for feeding value, the local products compare very favourably with the German and American ones.

3. Residues from Production of Acetylene.

I have recently had several enquiries as to the use of these residues for manurial purposes, and it may be well to give some account of the material for the guidance of those who are in a position to obtain it in large quantities.

The raw material for the production of acetylene is "calcium carbide." This commercial substance consists mainly of calcium carbide, but contains small quantities of phosphides of calcium and magnesium, and of sulphides and silicides of calcium. By the action of water the chief substance left consists of calcium hydroxide (slaked lime), but also contains small quantities of phosphates, sulphates and silicates. While still fresh, it may also contain small quantities of unoxidised compounds—sulphides and phosphides of calcium, and even some unchanged carbide of calcium.

These latter substances are plant poisons, so that the material from the acetylene generators should not be used at once, but exposed to the action of the air for a few days or weeks before application to the soil. This, though it involves a slight loss of activity owing to the lime absorbing carbon dioxide and thus becoming converted partly into carbonate of lime, is advisable, because of the simultaneous destruction by oxidation of the injurious constituents referred to. On many of our soils, deficient as they are in lime, such a residue would be very useful. It might be applied at the rate of about 300 lbs. to 400 lbs. per acre (*i.e.*, 1 lb. to about 12 or 16 square yards) as top dressing, and forked or raked in. The plants or seeds should not be planted until a few days after the application of the lime, as in its fresh state it is liable to injure rootlets.

THE FORESTRY SECTION.

OSIER OR BASKET WILLOWS.

By C. E. Legat, B.Sc., Conservator of Forests.

Arising, no doubt, out of the movement that is at present on foot to promote local industries, enquiries have been received by the Department from various parts of the Transvaal as to whether osiers suitable for basket making can be grown or are obtainable in the country.

As far as is known there are no osier holts in the Transvaal, and beyond the introduction of a few varieties of osier willows into the country by private individuals, nothing was done in this direction, till about three years ago when this Division imported cuttings of as many species as were procurable from the Cape. These were propagated at Irene Nursery, and the cuttings so obtained were in turn distributed to the Government Nurseries at Pan, Belfast and Ermelo to be propagated there. Sufficient stock has been obtained at the two former places to enable trial osiers to be planted.

A small quantity of last year's crop of osiers at Irene—most of it being required for propagating purposes—was peeled, and the withes obtained proved to be of very fair quality (Plate 18) ; and were of such a nature as to justify a more extended trial of osier culture.

The withes yielded by Salix purpurea have so far proved the most satisfactory, being finer, more even and flexible than the others. Salix caprea, which grows well in Cape Colony and furnishes good material for the coarser kinds of basket ware, does not promise so well here.

In addition to the osiers imported from the Cape Colony, cuttings of 35 different sorts have recently been received from the Royal Botanical Gardens, Kew, and among them are included all the best known varieties. These are being propagated at Irene as rapidly as possible for distribution to the other Government Nurseries and to the public.

The identification of osiers, owing to the numberless hybrids that exist, is very difficult. It is therefore satisfactory to have been able to obtain our parent stock from such a reliable source as Kew, and to feel that there is no fear of propagating comparatively worthless sorts instead of well known and approved ones.

In view of the interest that is being taken in the matter at the present time, it may not be out of place to give a few notes on osier cultivation for the benefit of intending planters. As I mentioned before, nothing has yet been done with osier cultivation in the Transvaal. Consequently, the methods recommended here are those

generally followed in Europe and America. They may perhaps have to be modified to suit local conditions, but they will serve as a basis to begin on.

* * * *

Osiers thrive best on moist deep fertile soil, such as is frequently to be met with in vleis of this country. Low lying sites where water stagnates are not, however, suitable, at any rate until they are properly drained. It is a mistake to suppose that because willows are usually associated with water, that any wet or boggy place will suffice for them. In order that osiers may grow well, it is essential that the ground on which they are to be planted should be well drained. A site, which is flooded several times in the course of the summer, is very desirable, or if one is secured below a water-furrow, so that flooding can be carried out at will, that would be better still.

In preparation for planting the soil should be deeply ploughed and thoroughly worked, and it is the usual practice, unless the soil is very rich, to manure it well. Osiers are grown from cuttings 12 inches in length, made from one-year-old rods. Planting should be performed about the middle of July.

Experience in other countries has shown that close planting is most profitable, and the cuttings are spaced at distances varying from 16 in. by 4 in.—about 100,000 per acre—to 24 in. by 12 in.—about 24,000 per acre. Probably an espacement of 16 in. by 8 in. is the one most generally adopted nowadays. This requires about 58,000 cuttings for one acre. In planting care should be taken that the top of the cuttings are level with the surface of the soil.

* * * *

After planting the main point to attend to is keeping the soil cultivated and free from weeds. In this country irrigation in spring and also during the dry spells in summer will be beneficial.

The osiers should be harvested each winter, except every fifth year or so, when they should be allowed to stand, and the two-year-old rods harvested the following season. This practice is said to prolong the life of the osiery, which may run from 12 to 20 years. Great care should be taken in cutting the osiers to remove them as close to the stool as possible, as careful cutting greatly influences the yield and longevity of the holt.

The usual method adopted in peeling the osiers is to place them, on the approach of spring, with their butt ends in 3 in. to 4 in. of water. The osiers then send out foliage, and when they have sprouted from top to bottom they can easily be stripped.

The rods are passed once or twice through a steel clip to loosen the bark, which can then be readily removed by hand. After being carefully dried in the sun the osiers are graded into sizes, and are bundled together for sale.

Plate 18.

Osiers for Basket-Making.

(*Salix purpurea.*)

Grown at the Government Forest Nursery, Irene.

The yield of green rods in Europe is about 5 tons to 6 tons to the acre, and of dried withes, half that. The cost of peeling is about £1 per ton, and the value of the white rods runs from £10 to £18 per ton. At present it is clearly impossible to say whether osier growing will be profitable in the Transvaal or not ; but it is hoped that the above information will serve as a guide to those proposing to test the matter.

Data are wanted as to the cost per acre of growing osiers, and the yield, as well as information as to the most suitable sorts to grow, etc. The varieties of osiers most commonly grown in Europe are the following :—

Salix purpurea (the Welsh or purple willow).
Salix viminalis (the white willow).
Salix amydalina (the almond willow).
Salix rubra (S. purpurea X. S. viminalis).
Salix triandra.

It may be of interest to mention that the value of basketware and rattan imported into the Transvaal in 1905 was £2,492, and that in 1906 it mounted up to £3,593.

A Use for Poplars.

The Managing Director of the Lion Match Company, Box 455, Durban, writes inquiring if any white poplar wood is available in the Transvaal in the vicinity of the railway. The company cuts up into matches every month close upon 2,000 logs, 7 feet long, and 12 in. to 14 in. in diameter.

So far most of the wood has been imported from Europe. The company is prepared to pay 1s. 6d. a cubic foot at Durban, or a little over, provided the wood is of good quality. It is possible that it may pay farmers residing in the Standerton and Heidelberg districts who have large sized poplars, to dispose of them to the Match Company. Railage will amount to about 6d. a foot. About 65 cubic feet of poplar go to the ton. Inquiries respecting the matter should be addressed to the manager of the company direct.—(C.E.L.)

THE BOTANICAL SECTION.

WHEAT GROWING IN THE WESTERN TRANSVAAL.

By J. Burtt-Davy, F.L.S. (Agrostologist and Botanist).

The imports of wheat into the Transvaal, as officially reported by the Director of Customs, for the year ending 31st December, 1906, are shown by the following figures :—

	Weight.	Value.
Wheat	3,631,978 lbs.	£15,537
Wheat flour	98,344,719 lbs.	£440,478
Do., ground from imported wheat ..	10,523,699 lbs.	£44,085
Bran	20,347,427 lbs.	£50,973
Total	132,847,823 lbs.	£551,073

Wheat and wheat products, to the value of half a million, are imported each year. The question naturally arises could not this be produced here and save so much money from going out of the country? Before it can be answered it is necessary to secure particulars concerning the wheat already being produced in the Transvaal, and to what extent this production can be increased. The Transvaal wheat harvest takes place in the months of October and November. This being the season when the Division of Botany is kept most busy with Co-operative Experiment work and correspondence with farmers, it has always been my misfortune to miss the wheat harvest, until this year, and so I have hitherto had but little data on the subject. This year I have taken the opportunity to visit the principal wheat-growing areas, and some observations made at the time may be of interest to readers of the "Journal."

Wheat Areas.

Owing to the prevalence of Rust during the summer season, wheat-growing in the Transvaal is restricted to the winter months from May to October. This being the dry season, the wheat is grown only as an irrigated crop, and the main area available is confined to irrigable lands of the upper Bush Veld, along the principal streams bordering on the High Veld. Small patches are also sown under dams and along streams on the High Veld itself.

The principal centres are in the Marico, Rustenburg, Pretoria, Potchefstroom and Lydenburg Districts. The Groot and Klein Marico Rivers furnish the largest areas under wheat, but until the opening of the new Zeerust railway, little or none of this reached the larger markets of the Transvaal, the ox-transport rate of 8s. per bag (4s. per 100 lbs.) being prohibitive. The surplus not required in the District

went to Mafeking and Bechuanaland. The Elands, Hex and Magalies Valleys in the Rustenburg District, the Crocodile Valley in the Pretoria District, and the Waterval and Ohrigstad Valleys in the Lydenburg District, also grow good wheat, but perhaps little more than enough for local consumption. The droughts of the last few years have so reduced the output that few Transvaal farmers have grown more than enough for their own use. Being poor those who had not enough went without ; this is said to be the first time in several years that some farmers have had enough wheat for their own use.

* * * *

Varieties Grown.

There are three classes of wheats grown in the Western Transvaal, the Durum or Hard-wheats and the Soft-wheats.

Durum type.

1. Wit klein koren.
2. Rooi klein koren.

2*a*. Eksteen.

Soft type.

3. Rooi wol koren.
4. Wit wol koren.
5. Baard wit wol koren.
6. Baard rooi wol koren.
7. Baard holstrooi.
8. Potchefstroom white.

Type uncertain.

9. Zwart baard.
10. Golden Ball.

The Durum, or hard wheats, are the types used in Italy for the manufacture of Maccaroni ; they are "strong" wheats, containing more gluten than the soft wheats, and are therefore much sought by millers for mixture with the latter. The hard wheats when used alone do not make such white flour as the softs, but they absorb more water, go farther, and more bread can be made from 100 lbs. of the former than from an equal quantity of the latter.

1. *Wit klein-koren, Plate* 19, *Fig.* 2.—A short-stalked small-eared, white, bearded, glabrous durum wheat. By many farmers it is considered the best wheat of the country, though others prefer the softer-grained, beardless Wol-korens. On many farms it was lost during the war and has not again been obtained, but some plants are to be found in almost every wheat field, and a few farmers have re-established their stocks by selecting two or three and growing them separately ; these farmers are now in a position to sell to their neighbours. The plants of Klein koren are low of stature as compared with the Wol-korens, hence the name *Klein*-koren ; the ears are smaller and average fewer grains than in the Wol-korens, but it is evident from

the great variation in size under similar conditions, that this fault could to some extent, at least, be improved away. Klein koren is said to require much manure, and it is not recommended for un-manured lands unless they are very rich. In the Crocodile Valley it is usually grown on lands manured with Kraal manure and cropped with Tobacco during the previous summer.

2. *Rooi Klein-koren, Plate* 19, *Fig.* 1.—This differs from the Wit chiefly in the browner colour of the glumes and beards. It is at present much more plentiful than the white variety.

2*a*. *Eksteen.*—Resembles the Wit Klein koren, but is said to be some three weeks earlier in coming to maturity.

3. *Rooi Wol-koren, Plate* 20, *Fig.* 1.—A beardless, tall-growing, heavy-headed variety, stooling well, *i.e.*, producing a large number of stalks from a single root; the grains run from 75 to 109 per ear; the outer glumes are densely clothed with brownish-red down hence the name *Wol* koren. This is the most widely grown variety in the Marico and Crocodile Valleys, and in the opinion of most farmers it divides honours with Klein koren as one of the two best wheats for these regions. For poor and unmanured lands it is considered the best wheat grown. The "wol" is considered objectionable, as it is said to felt the sieves of the machines; in damp seasons it hinders the drying out of the sheaves as the moisture is retained longer than on the smooth ears of the Klein korens.

4. *Wit Wol-koren, Plate* 20, *Fig.* 3.—Resembles the last, but the tomentum is white. Specimens of this variety are to be found in almost every wheat field in the country, but one rarely finds it grown alone. Mr. Sephton, of Riekert's Dam 203, and Mr. Dirk Nolte, of Rhenosterfontein 13, both on the Groot Marico, have pure stands on small areas. Occasionally one finds ears showing a tendency to produce beards.

5. *Baard Wit Wol-koren, Plate* 20, *Fig.* 4.—I have only found this as a volunteer in stands of other sorts, and then only on one farm. The beards are objectionable, except as a protection against birds.

6. *Baard Rooi Wol-koren, Plate* 20, *Fig.* 2.—This appears scattered more or less abundantly as a volunteer in almost every field of other sorts; I have not seen it grown as a pure stand. It has the colour of the Rooi Wol-koren, but with smaller heads and bearded with blackish beards. It shells out easily and early, and this may account for its frequent occurrence. It seems to be an undesirable sort and is not liked by farmers, but it should be studied carefully before being discarded altogether.

7. *Baard holstrooi, Plate* 19, *Fig.* 3.—This closely resembles well-grown specimens of Wit Klein koren, but the grain is soft and white; it is said to make an excellent flour. The straw is soft and coarse, hence the name. Although commonly grown in the Crocodile Valley, I saw it on only one farm in the Marico District.

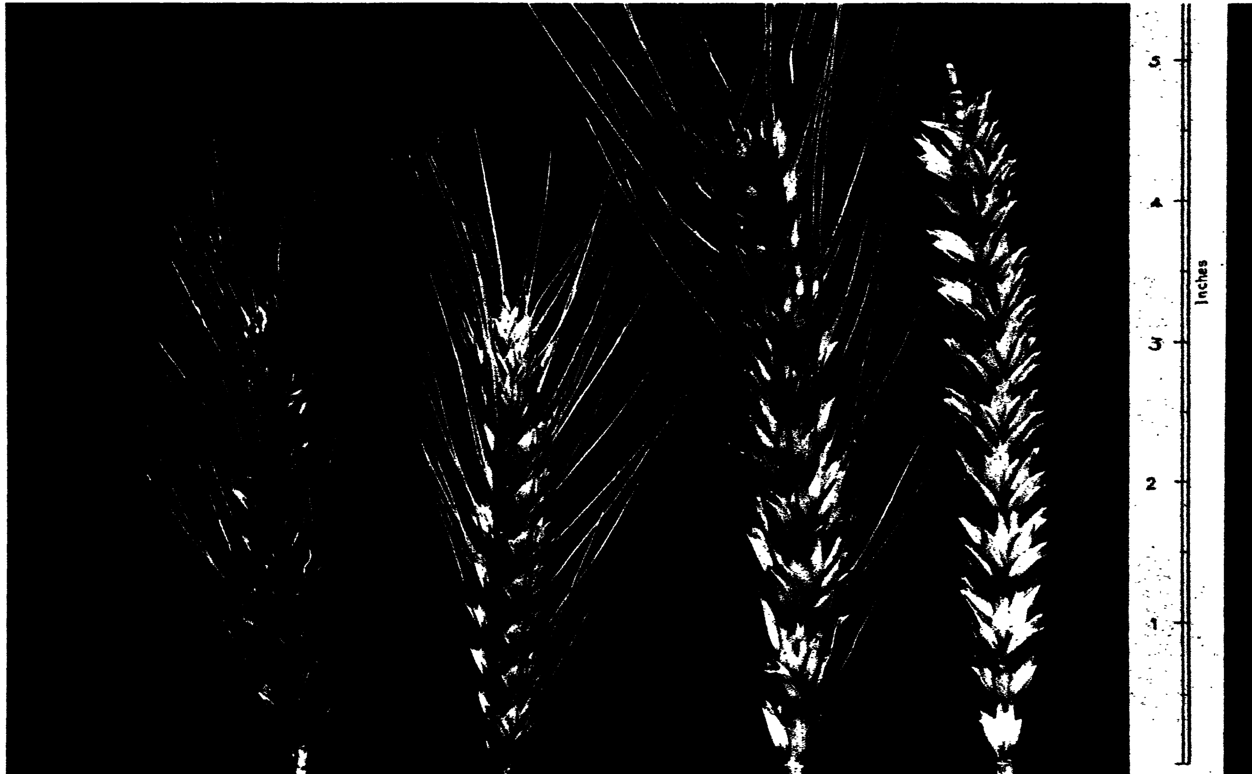


Plate 19. Fig. 1. Fig. 2. Fig. 3. Fig. 4.

Transvaal Wheats.

Fig. 1.—Rooi Klein-Koren. Fig. 2.—Wit Klein-Koren. Fig. 3. Baard Holstrooi. Fig. 4.—Potchefstroom White.

Plate 20. Fig. 1. Fig. 2. Fig. 3. Fig. 4.

Transvaal Wheats.

Fig. 1.—Rooi Wol-Koren. Fig. 2.—Baard Rooi Wol-Koren. Fig. 3. Wit Wol-Koren. Fig. 4. Baard Wit Wol-Koren.

8. *Potchefstroom White, Plate* 1, *Fig.* 4.—This resembles the beardless Wit Wol-koren, but the glumes are smooth and shiny. A few specimens can generally be found in any field of wheat, but I have only seen one pure stand, and that was on the farm of Mr. Dirk Nolte, Rhenosterfontein 13, Groot Marico. Three seasons ago Mr. Nolte picked out a few ears from among his other wheats and sowed them apart from the others, harvesting the seed by itself. Last season he sowed from the progeny about a bag of seed, and now has 30 to 40 bags, which will enable him to test its comparative yield and milling qualities.*

9. *Zwart-baard.*—This is said to have been grown extensively before the war, but seems to have been lost since, and is now rarely found. I have not seen it in the Transvaal, except near Potchefstroom, but am told that Mr. van der Merwe, of Rhenosterfontein 13, Groot Marico, has a little; unfortunately, I was unable to visit his farm.

10. *Golden ball.*—This is another much prized variety which seems to have been lost during the war. I have not seen any of it in the Transvaal. It is said to make good bread, and we have received many enquiries for seed. If any farmer has a little, it would probably pay well to grow it for seed, which could then be advertised in the pages of the "Journal."

Soils.

In the Transvaal wheat is grown on four types of soil :—

1. The red sandy loam.
2. Grey sandy loam.
3. Red "turf"; a heavy red clay.
4. Black turf; a sticky, limy clay-loam, drying out quickly and cracking badly; a difficult soil to work, and not good for crops in seasons when water is scarce.

Of these different soils the Marico farmers prefer the "Red turf"; it appears to give much heavier yields than the grey sandy loam. The red sandy loam seems to vary greatly in quality, sometimes giving excellent crops, though in other places less productive.

Crop Rotation and Manures.

One farmer leaves part of his wheat land fallow during the summer, his object being to avoid taking too much plant food out of the soil in one year, as is probably the case where a summer crop of mealies follows wheat. Better results would almost certainly follow the growth of some leguminose crop such as Velvet-beans, Cowpeas, Soybeans, Pea-nuts or Sugar-beans, which add nitrogen as well as humus to the soil, and improve its texture as well as its crop-producing

* Since this article was written I find that this particular wheat is largely grown in the Mooi River Valley, Potchefstroom District, and at the suggestion of Mr. A. Holm, General Manager of the Government Experimental Farm, Potchefstroom, I am calling it the Potchefstroom White. It is sometimes known as Kaal-kop, but this name applies equally to other sorts.

power. Part of this crop could be harvested for seed, and the straw and roots ploughed under, but it would be desirable to plough under a proportion of the green crop each year ; this is one of the most economical methods of manuring where nitrogen and humus are especially required. One farmer in the Groot Marico Valley is already doing this.

Where tobacco is grown as the summer crop, the ground is manured with Kraal-manure, which also has a beneficial effect on the succeeding crop of wheat.

Some wheat farmers tried potatoes as a summer crop, planting in December and January ; but, through lack of knowledge, all but the best growers failed to produce heavy, payable crops. For potatoes the ground is dressed with Kraal manure, and the beneficial effect is noticeable in the succeeding wheat crop.

Most wheat farmers fall back on Mealies as their summer crop, as they are more easily grown than potatoes or tobacco ; but mealies prove an exhaustive crop after wheat, and this system of rotation cannot be recommended unless manure is used.

The objection raised against manuring is that kraal manure is so scarce and artificial fertilizers are so expensive ; both points are well taken ; but what I have seen shows me that a great deal more manure could be made if kraal or stall feeding were more extensively practised, and if greater care were taken of that which is made. Under the present system the kraal is often placed on a relatively high, dry place ; the heavy summer rains pour down upon it and leach out a large part of the rich nitrogenous matter of the manure, which runs away and is lost. The manure, being exposed to the burning sun, dries out quickly, and every night is trampled into powder by the cattle, part is then blown away by the strong winds. Little or no use is at present made of the wheat straw ; if this were stacked, and a little thrown into the kraal each night, it would absorb the liquid part of the manure, prevent the latter being blown away, and considerably increase the amount available for the fields. If this were taken out of the kraal occasionally and allowed to rot in a pit, covered from the rain, it would improve in quality, and be saved from waste. The increase in work would be so slight as scarcely to be noticed.

* * * *

Sowing.

Seed wheat is sown broadcast, in quantities varying from half a muid sack (100 lbs. of seed) per morgen up to about one muid sack (200 lbs.) to 2½ morgen (1 morgen = 100 × 100 yards). One piece, on which 125 lbs. had been sown, measured 1.913 acres ; and another, on which 200 lbs. had been sown, measured 2¼ acres. In the Crocodile Valley sowing takes place at the end of May or the beginning of June, perhaps to minimise risk of locusts. In the Marico Valley the end of April and the beginning of May seem to be preferred. The ends to

be observed in choosing the sowing season are :—(1) To avoid bringing the plants to the flowering stage while there is danger of frost. (2) To allow it to ripen off before the heavy Spring rains of November set in. (3) To sow late enough to minimise the risk of total destruction of the crop by swarms of locusts in late Autumn.

This season the crops were badly eaten off by locusts, in some cases two and even three times ; this thinned out the plants severely, but at the same time it may have induced the remaining plants to stool-out better than might otherwise have been the case, and in spite of locusts the crops are considered to be at least twice as heavy as they were last year.

This year the harvest is unusually late, and had the rainy season set in at the normal time much of the crop would have been injured ; fortunately it is in very good condition. Farmers generally attribute the lateness of the crop to the effect of locusts, but it seems more probable that it is due to the good rains of September ; these caused a new growth of stems from the crown, which were only just ripening at the time of my visit, whilst the old stalks were well matured. But for this rain the crop would probably have ripened off with the advent of warm weather, in spite of the locust attacks in Spring.

* * * *

Irrigation.

The amount of water used and the frequency of irrigation seem to depend solely on the amount of water available. The usual number of irrigations is five to eight during the season. In many cases, this season, it has perforce been reduced to three, two, and even one only. On the farm "Welverdiend 48," I saw some six to eight morgen of very good wheat *which had received absolutely no irrigation* from the day it was sown (in May) until it was reaped (middle of November) save the natural rainfall in September ; it is possible that but for this the crop might have been a failure. The effect of drought was shown by the fact that the plants had not developed the usual adventitious roots, and held so loosely to the soil that they had to be pulled by hand, as neither sickle nor reaper would cut them. The soil is an exceptionally rich piece of red, sandy, alluvial land, of peculiarly good texture, retaining moisture admirably. It will be well worth while to take some of this same seed and to grow it again on dry lands, which have been properly prepared during the summer season to receive and retain as much as possible of the summer rainfall. If we can by this means develop dry-land winter wheat growing similar to that in the Conquered Territory of the O.R.C., it may help to solve the problem of supplying our own wheat demand.

It is instructive to note that the finest samples of grain seen in the Marico District were those *grown with the least water.*

Much loss of time and labour is occasioned by the regular breaking of the "dams" (diversion weirs) in the summer floods. If the owners of lands under a "dam" would co-operate to put up good masonry weirs, on the most approved plans, a great saving might be effected.

HARVESTING.

Harvesting usually takes place in October, occasionally, as this year, it is delayed till November. On most of the farms the crop is cut by native women and men, with the sickle, the bundles being tied with straw bands made by hand. One cannot fail to be impressed with the costliness, slowness and wastefulness of this method ; the wastefulness is partly due to those who use the sickle dropping stalks behind them for the native gleaners—their wives and children—to pick up.

The general excuse for hand-cutting is that the irrigation furrows are too rough for machinery. One farmer gets over this difficulty by running a single furrow, hillside plough, to fill up the furrow before cutting the crop ; it is drawn by two mules or oxen harnessed tandem fashion, and the result is entirely satisfactory. A few farmers use the Self-binding reaper, with great economy of labour and time, and there is no reason why it should not be used on practically all the wheat fields. It might pay some enterprising farmer to keep several machines, sending them out on hire ; or, better still, for the farmers in one locality to co-operate for the purchase of one or more machines.

THRASHING.

I am told that thrashing is still done in a few cases by means of horses or oxen trampling the straw, the product then being winnowed by hand. Several farmers own steam thrashing outfits, which travel from farm to farm thrashing up the whole crop before they leave. The cost is paid in kind, one bag of grain for every ten or twelve thrashed ; the present value of a bag to the farmer is about 20s., while in Pretoria it retails at 30s.

YIELD.

The yield of wheat is estimated entirely by so many fold, that is by the number of bags harvested for every one sown. This varies on different farms and on different soils, from 22 to 50 muid sacks for every one sown. A muid sack weighs 203 lbs. As the amount of seed sown per given area of ground varies tremendously, sometimes as much as 150 per cent., the returns given have no relative value ; it is therefore impossible to tell from them what the producing power of a particular piece of ground really is, whether it is deteriorating or improving under certain conditions, or what is its intrinsic value. The difficulty in securing data is due to the fact that scarcely a farmer in the districts visited knows the precise area of his cultivated lands, or exactly how much is sown to wheat and how much to oat-forage. If the exact total area were known, of course the yield per morgen could be obtained without difficulty. On several farms I took the opportunity to chain off certain fields, the produce of which was to be thrashed separately, and obtained the promise of the farmers concerned to report the actual number of bags obtained from those areas.*

* Some figures are now to hand, which show the actual yield in two cases to be 29 bushel (of 63 lbs.) or 9 sacks of 203 lbs.

In some cases the yields are given in so-called "machine bags," varying from 220 to 250 lbs. These "machine bags" of wheat are obtained by pressing as much grain as possible into one sack in order to save the cost of sacks ; in the case of soft wheats this treatment may perhaps reduce the value of the grain more than the amount saved in sacking.

This is the first year since before the war that good wheat crops have been reaped ; some farmers have double the crop of last year, in spite of locusts, and many will, for the first time in this period, have enough to carry them through the year. The extra crop does not necessarily mean, however, that there will be much more for export to other parts of the Transvaal.

* * * *

Need for Selection of the Seed-Wheat.

I was impressed with the great mixture of varieties to be found in almost every field of wheat. This is not a good thing, since it reduces the value of the grain for milling purposes, and gives an excuse to the buyer to lower his price, while entirely condemning it for export. The need for improvement is recognised by many, and a few of the more enterprising farmers manage to keep their crops fairly uniform by going through the fields and "rogueing" out the alien plants. In most cases, however, the varieties are so much mixed that this method would be impracticable. Some farmers have suggested the need for a change of seed, but the difficulty at present is to know where to obtain seed of the same strains better, cleaner and less mixed than that already on the farm.

Another source of loss is the large percentage of weak plants with few stalks and small ears containing little grain. Such plants occupy space which might just as well be filled by vigorous plants, "stooling" well (*i.e.*, producing a large number of stalks from one root) and bearing large, well-filled heads. When pointed out to them, many farmers saw this point ; but there are some who still believe that the inferiority of individual plants is due solely to local causes, such as lack of water, lack of manure, or the effect of locusts and other insect pests. But it has been proved over and over again, by actual practical test, that there is an enormous difference in the productiveness of different strains of the same variety, and I hope to provide an ocular demonstration of this next winter, for the benefit of farmers visiting the Botanical Experiment Station at Pretoria. When one sees two plants *growing side by side*, one bearing one or perhaps three stalks and ears only 2 in. long, and the other with nine to eighteen stalks and ears 3 in. to 7 in. long, no one who knows the difference in the yielding power of individuals can believe that this great difference is due wholly to local influences.

But my readers will ask "How can the desired improvement be effected?"

(1) Some practical men in the Marico District, already recognising the need for improvement, sift over the seed-wheat, and only sow the

largest grain. This method of selection is better than none, but it is not sufficient, and works slowly. It is probable that a percentage of the large grains come from plants bearing few stalks or small ears ; large grains may not always reproduce large grains, and may not always tend to the production of the greatest yield per morgen.

(2) Some farmers pick out a few of the largest ears in their fields and reserve them for sowing with their seed grain. This method of selection, though also better than none, is not the best ; for example, individually large heads may come from plants bearing few stalks ; the yield per plant may possibly be greater from a plant bearing many medium-sized heads than from one with a few very large heads.

(3) The ideal method is to select out from the standing field a certain number of the most productive and in other ways most desirable plants, to act as *Mother Plants*, from which to propagate an improved strain. It will probably be found that some of these—perhaps many of them—having been more or less cross-pollinated with inferior strains, will show deterioration next season ; all such should be rigorously discarded. In order to do this work thoroughly, it is desirable that the seed from every plant should be sown in a separate plot, so that the progeny of any Mother-plant showing a large tendency to deterioration may be discarded altogether. In two or three seasons the selected strain may be fairly well fixed, and enough seed secured to sow a fairly large propagation plot.

Theoretically, it is best to select 100 plants for the first breeding plots. The practical farmer usually has not the time to give to such an elaborate piece of work as is involved in the growing of 100 separate plots each comprising 750 plants. This is work which rightly devolves on the Government Botanical Experiment Station, and it is hoped that this Department will be able to carry it out. I have made some selections of wheats on a number of different farms, grown under varied conditions of soil, climate and irrigation, and after photographing them and making careful notes on the characteristics of each, they will be sown at Skinner's Court under uniform conditions of soil, water and treatment. From the progeny of these it is proposed to select out the best strains, and when enough seed has been secured for acre plots, to send it to one of the Experiment Farms for propagation on a large scale. From these stocks farmers will then be able to secure good and pure strains of acclimatised seed of the best local varieties of wheat. I am satisfied that the yield per morgen can be considerably increased and the quality improved in this way. It has been done in other countries with remarkable success and great profit to the farmers, and there is every reason to expect equally good results with our Transvaal wheats.

* * * *

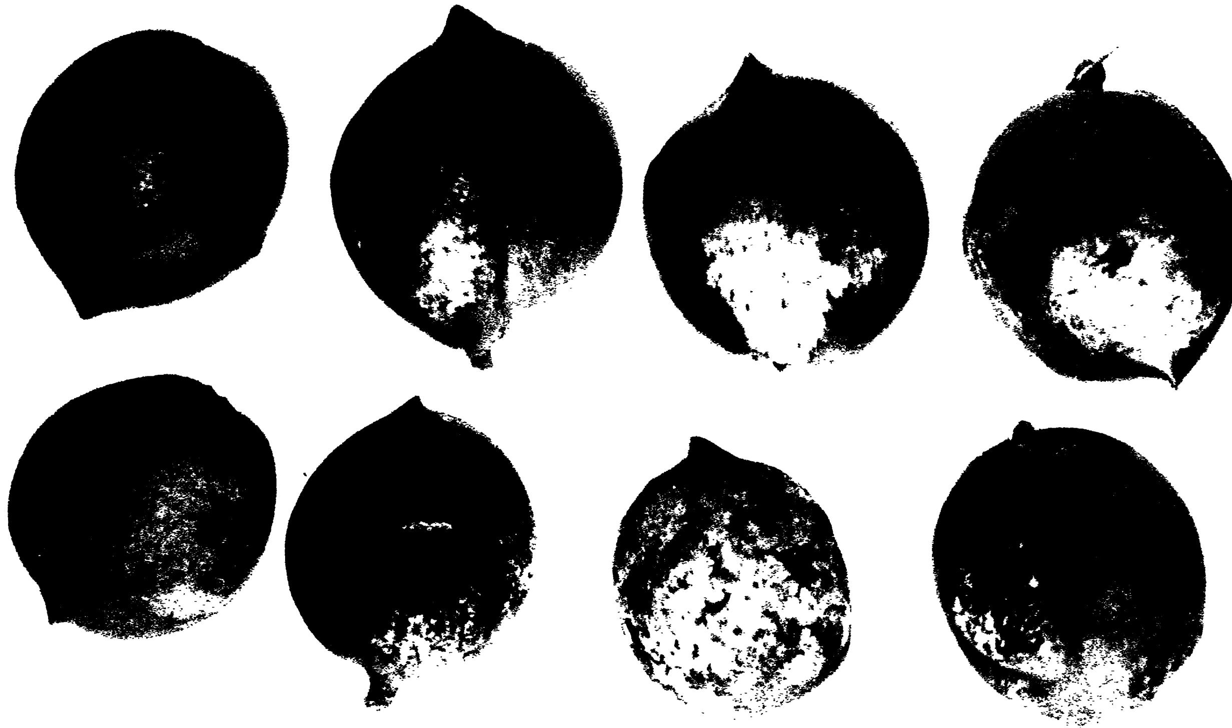
The Area Might Be Increased.

It is a somewhat surprising fact that almost every farmer who grows wheat grows as large or a still larger area of oat-forage, also under irrigation. If the growing of forage on good wheat-lands could

Plate 21.

"Leaf Curl" Fungus on the Nectarine.

(*Exoascus deformans*, Fckl.)



Peach Leaf Curl Fungus.

(*Exoascus deformans*, Fckl.)

On Nectarines.

be abandoned, the production of wheat could be doubled. If one-fifth of the area now growing oat-forage were planted to Lucerne, an equal bulk of baled Lucerne forage might be produced, and the remaining four-fifths of the oat-forage area might be sown to wheat without reducing the total output of forage. By improved methods of sowing, tillage and harvesting, and by proper selection of heavy-bearing strains of seed, it is probable that the yield from the area now under crop might be increased—probably by 30 per cent. At the time of writing thrashing is not half done, and it is impossible to gauge the total production, but arrangements have been made to secure these data. Rough estimates have been given me of 100,000 bags. An increase of 30 per cent. would raise it to 130,000 bags. Supposing that four-fifths of the area now devoted to oat-forage were given over to wheat, with improved methods of tillage and seed selection, this might add 120,000 bags, bringing up the total to approximately 250,000 bags, or 50,000,000 lbs. While these figures are of the roughest, they will suffice to show that whatever the present output it could probably be increased by 150 per cent.

But even with this increase, local production would not supply the demand, and some other means must be sought if we are to meet it. The fact that wheat has been grown this last winter without irrigation other than the natural rainfall, suggests that it may be possible to breed up a profitable strain of dry-land wheat suitable for cultivation on a large scale on the High Veld. We propose to follow up this suggestion, and to see what can be done in this direction.

The particular varieties grown in the Lydenburg District and the numerous sorts from Cape Colony and the O.R.C., and grown this season on the Experiment Farm at Potchefstroom, must be left over for discussion at a later date.

PEACH LEAF CURL.

Exoascus deformans, Fckl.

By I. B. Pole Evans, B.A., B.Sc., F.L.S. (Plant Pathologist).

During the past season peach growers in this Colony have been troubled with a disease which is commonly known as "leaf curl." In some localities "leaf curl" has been so bad as to cause the complete defoliation of the trees, while in others the fruit has been so affected as to be rendered useless. Plate 21 is a photograph of diseased material which was sent to the Department for identification and advice as to treatment. The disease is due to a parasitic fungus which attacks the leaves, young shoots, flowers and fruit of the peach and like fruits, *i.e.*, nectarine, apricot and almond.

Leaf curl is commonly seen in early spring, as soon as the trees shoot out into leaf, and is most severe in moist seasons, especially when sudden changes of temperature are experienced with warm and cool weather. The leaves become enlarged, blistered, thickened, crumpled and finally fall, while the normal green colour is changed first to a

yellowish green and then to a roseate hue, with a more or less mealy appearance on their upper surface. The fruit in the case of the nectarine becomes covered with a very marked wart-like growth, while apricots affected with the fungus are so arrested in their development that they barely reach half their normal size and soon drop. Such apricots exhibit a dull, reddish-brown scab-like growth, from which drops of gum frequently exude.

* * * *

Prevention and Treatment.

"Leaf curl" infection may be brought about in two ways, either by means of the fungus which has wintered over in the affected shoots, or through the spores which were formed on the diseased leaves and fruit.

Extensive observations and experiments which have been carried out on this disease show very clearly that the latter method of infection is by far the most important one, and that as high as 98 per cent. of the spring infections can be prevented by the single application of a suitable fungicide.

The infection occurs directly the buds begin to unfold, and consequently the successful treatment of leaf-curl depends very largely upon some method of preventing the fungus from infecting the early spring growth. This can be accomplished by spraying from one to three weeks before the blossoms open in spring, when all parts of the tree should be thoroughly drenched with the spray. To avoid, as far as possible, any chance of infection from the fungus which may have wintered over in diseased shoots, all such should be well pruned back.

The most effective spray for the treatment of "leaf curl" is the Bordeaux mixture in the proportion of 5 lbs. of copper sulphate, 5 lbs. of lime and 45 gallons of water. The mixture should be made up as follows : Place the 5 lbs. of copper sulphate, after crushing, in a 45-50 gallon cask and dissolve in ten gallons of water. Then in another cask slake 5 lbs. of quicklime, which should be of the best quality, and add 10-12 gallons of water. Strain the milk of lime into the copper solution, stir well and add sufficient water to make up 45 gallons. When cool the mixture is ready for use.

In dealing with "leaf curl" the trees should be sprayed regularly every spring, for it does not follow that if the trees are free from the disease one season they will be so the next. Not only will it be found that spraying prevents "leaf curl," but it will also be found to induce healthier foliage and heavier crops.

NOTES ON LUCERNE GROWING
(*Irrigated*).

By H. Godfrey Mundy, P.A.S.I., Asst. for Seed and Plant Experiments.

1. **The most important point to be borne in mind when preparing to lay down lucerne is that a deep well-drained soil is an absolute**

necessity; the most desirable class of land is a rich loam, but excellent stands are raised on light red soils and also on black turf, provided that there is the necessary depth (6-10 feet) of free working soil and sufficient water for irrigation whenever it may be required.

The land should be ploughed deeply and then cultivated to a moderately fine tilth; when possible ploughing and cross-ploughing are to be recommended. Under climatic conditions such as are prevalent in the Transvaal, it is desirable that the land should not be left too open after ploughing, and, in order to avoid this, a final rolling and harrowing will be found beneficial.

Either new land or old land which has been *thoroughly cleaned* are suitable for lucerne, but it is most important that weeds should have been to a large extent eradicated; nothing is more injurious to a young stand of lucerne than a thick smothering crop of weeds. Once the crop is well established, weeds may be kept down by cultivation and harrowing, but during the early stages of growth this is not practicable, and hand-hoeing, an expensive and very lengthy operation, will need to be resorted to. In many cases where lucerne is sown on foul land, it is found almost impossible to get rid of the weeds, and more often than not the stand has to be ploughed up.

2. *Sowing.*—The seed should be drilled in rows 12-18 inches, or even 2 feet apart. Opinions differ as to the best distance of planting, but our experiments lead us to believe that the heaviest yield per acre will be obtained when the rows are 12 to 18 inches apart on irrigated land, and 9 in. to 12 in. on dry land.

Drilling the seed in rows is strongly to be advocated as against broadcasting; where the stand is drilled cultivation is made considerably easier, and weeds can at any time be eradicated with a minimum of labour. The seed may be sown any time after the last frosts of winter, but it is advisable to plant during the earlier or later months of the summer, as the heat of the sun is often so great from the middle of October to the end of December, that the young seedlings are liable to suffer from "sun scorch."

Nurse crops are not to be recommended in the Transvaal; where an abundant supply of water is available for irrigation, the crop should thrive well and remain free from sun scorch without the aid of a nurse crop; when the water supply is short and the young lucerne likely to be called upon to withstand protracted droughts, the presence of a nurse crop will only tend to still further exhaust the soil moisture and cause the lucerne to suffer.

There is, however, one method of nurse cropping which occasionally meets with good results, and this is the practice of sowing lucerne under irrigated winter barley or oats. In this way when the warm weather comes the lucerne is well established and able to start strong growth at once, while, in addition, a more or less valuable crop has meanwhile been taken off the land. The main objection to this method

is the added difficulty of drilling the lucerne, and the fact that such a treatment almost invariably tends to produce a patchy, uneven stand. When following this course care must be taken to sow at a time when the seedlings will not be injured by frost, to which they are very sensitive.

3. Lucerne does not reach its full bearing until about the third year, by which time, under favourable conditions, an average of at least six cuttings per annum may be expected in addition to a considerable amount of grazing.

The yield of green fodder per acre will vary from 2½ tons for the first cutting of the year up to 4 tons or even more for the main crops ; it has further been ascertained that, when converted into hay, lucerne loses two-thirds of its weight. Thus an average annual yield of about 6 tons of lucerne hay per acre may be expected, and, placing this at a moderate estimate of £5 per ton, a yearly return of £30 per annum, besides a considerable amount of valuable grazing, may be looked for. Where an adjacent market is available, a good trade may frequently be done in bundles of green lucerne during the early summer months, but, in the course of the next few years, the supply will undoubtedly exceed the demand, and the bulk of the lucerne grown in the Transvaal will have to be converted into hay and either baled for market or used for home feeding.

It should be borne in mind that, until lucerne has reached its full bearing, it should on no account be allowed to seed ; such a process is liable to have a weakening effect on the plants, and may, in some cases, cause them to die out entirely.

4. *After-Treatment.*—A lucerne stand will at all times be greatly benefited by judicious cultivation and harrowing. The mere fact of stirring the soil appears to have a stimulating effect on the plants, and the more the roots are knocked about, providing only that the crown is not injured, the better will be the results. It is desirable to follow the harrow or cultivator with a roller, otherwise the ground being left rough and uneven trouble may be caused when the time for cutting arrives. Where possible, lucerne should be irrigated the day following cutting, after which, as soon as the land is sufficiently dry, a cultivator should be put down the rows, followed by a roller when desirable.

By cultivating a lucerne stand two or three times during the year, not only will the yield be increased but the stand can be kept free from weeds.

5. *Manures.*—When the question arises of what manures to apply, it should be remembered that lucerne is a nitrogen-gathering crop, that is to say, it is able to collect nitrogen from the air ; this nitrogen is then stored in the roots, and nitrogen-supplying manures are therefore unnecessary ; as a rule the only manures needed are lime, phosphates and potash, and these are not urgently required unless the

land is in an exhausted condition. Kraal manure, unless old and well rotted, should never be applied to lucerne lands owing to the danger of introducing troublesome weeds, the seeds of which frequently lie dormant in manure for many months.

6. *Pests.*—The chief enemy of this crop in the Transvaal appears to be the lucerne caterpillar, and when this makes its appearance the best method of restricting its ravages is to promptly cut the crop and then keep it closely grazed or rolled. The object of this treatment is to destroy as many as possible of the live caterpillars and the eggs, and further to kill subsequent broods as they hatch out. After about a fortnight or three weeks of this treatment, the stand should be comparatively clean again, and, in this manner, the attack may be kept in check.

When a small area is being reserved for seed, or when the caterpillar has made its appearance on a young stand and is likely to destroy it, spraying with Paris green will greatly reduce the severity of the attack.

Trouble is often experienced also from a fungoid disease which causes "leaf spot." When this is observed a good remedy is to cut the stand, strew the stubble with dry grass and then burn it. This is a homely method of treatment, and in bad cases farmers will be well advised to seek other more scientific remedial measures from the Plant Pathologist.

Dry Land Lucerne.

There are several points of difference between dry land and irrigated lucerne; the former thrives better on a lighter class of soil; good stands can even be established on the red sandy loams of the Springbok Flats. On the other hand, heavy clay soils and black turf are rarely suitable on account of their tendency to crack and dry out during hot, droughty spells. A deeper soil should be secured for dry land lucerne than is needed for irrigated, as the roots must of necessity penetrate deeper in search of moisture.

The ideal soil appears to be rich alluvial deposits lying along rivers and old dry water-courses, many of such having an underground supply of free water at a depth of from 15 ft. to 30 ft. below the surface, but such deposits should be of a loamy rather than a clayey character.

Deep ploughing and thorough tillage are essential to success with dry land lucerne.

Sowing should not be attempted until that month when the most regular and continuous rains and cloudy weather may be expected; a drought of a week or ten days' duration coming shortly after the young plants are above ground may do inestimable damage.

Planting in drills is even more advisable here than with irrigated lucerne; cultivation between the rows in order to maintain a loose mulch of surface soil is most important if the best results are to be

obtained. Such a mulch, in addition to keeping down weeds, not only greatly facilitates the soaking in of rain water, but also checks the losses due to evaporation. The number of cuttings obtainable per annum will vary greatly according to season, and the class of land on which the crop is grown, but, on good lucerne land, and with an average rainfall, at least four to five cuttings should be obtained. The cuttings will, of course, be lighter than those given by irrigated lucerne, but a considerable amount of grazing should be secured in early spring and late autumn.

With regard to grazing—an important point to bear in mind is that lucerne should never be eaten down to the crown, as this not only weakens the plants but also checks the growth.

On some estates where lucerne is largely grown, a rule is made that first year stands are never to be grazed, second year stands only sparingly, and, even after the third year, never more closely than to leave a growth of from 2 in. to 3 in. above the crown. The value of a farm will be so greatly increased by a good stand of lucerne, either irrigated or dry land, that it behoves farmers to take every care of the crop both at the time of sowing and afterwards. To attempt to establish lucerne on soils which are unsuitable owing to one or other of the defects set forth in the above notes is mere waste of money and time.

THE ENTOMOLOGICAL SECTION.

THE SCALE INSECTS OF CITRUS TREES.

By C. W. Howard, B.A., F.E.S.

The scale insects or bark lice are among the worst insect enemies of trees and plants, and especially is this true of citrus trees. Of the fourteen or more pests of citrus trees which have so far been found in the Transvaal, more than half are scale insects, and of the remaining half three are closely related to the scales.

The purpose of this article is to discuss these scale insects. Before entering upon a discussion of them, however, it will be well to go into some of the details of their structure, in order that we may better understand the methods of combating them.

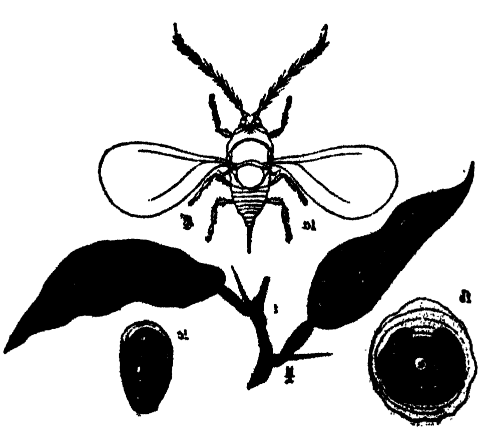
The scale insects belong to the order *Hemiptera*, usually called True Bugs. This group is characterised by possessing sucking mouth parts. The jaws have become modified into jointed tubes, which can be inserted into the tissues of plants, and through them the juices or sap are sucked up. Although the scale insects or *Coccidæ* belong to the order of bugs, they differ very remarkably from other families of this order. Even closely related species of scale insects differ very much from each other, and would not be considered ordinarily as belonging to the same family. The adult males and females usually differ so much as to give the impression that they belong to different orders.

For general purposes we can divide the scales into two groups, the armoured scales and the unarmoured scales.

The armoured scales include most of the important scale pests of the citrus trees. In this group there is a distinct scale, varying in shape, secreted over the back of the insect and often a second scale underneath. The accompanying figure of the Common Red Scale (Fig. 1) shows this characteristic. The upper scale is the stronger, although often nearly transparent, while the lower scale is very thin and delicate, or often wanting.

The insects of this group may either produce eggs or living young. The young are very small, possess eyes, two feelers, and six legs. They crawl about until they find a feeding place suited to them, then they insert their beaks into the plant and begin to suck out its juices. Soon the legs, eyes, and feelers begin to disappear, and the creature degenerates into a mere sac with a long sucking tube, incapable of any movement, and with the one function in life of reproducing its kind. The scale over the body varies in shape with the species, but is composed partly of cast skins of the insects and partly of a horny secretion. This is the story of the female. The male begins life in the same way, but the scale is always much smaller than that of the female, also often differing from it in shape. The scale of the male serves as a pupa case, in which it transforms into a winged insect, the mature male Coccid (Fig. 1). This male is of very minute size, often so small as to need a powerful lense to see its structure perfectly. There is only one pair of filmy wings, the second pair being represented by a pair of appendages with a hook on the tip, which latter fits into a pocket on the hind margin of the preceding wing. The mouth parts are lost, and in their place there is often substituted an extra set of eyes.

The unarmoured scales resemble the armoured scales, except that they form no protecting scale over the body. Instead, the body of the insect itself usually becomes modified for protection. Many of them do not lose the legs and eyes, and possess the power of locomotion to some degree throughout life. Among this group may be found the soft scale of the orange, *C. hesperidum* (Plate 23), and the Australian Bug, I. *purchasi* (Fig. 2).



Scale insects are found upon a great variety of plants and trees. Not only are our cultivated fruit and ornamental trees affected by them, but very many of our wild trees of South Africa have their particular pests among this group of insects. Some species are general feeders, being able to exist on a great variety of plants, while others are limited to a very small group, usually closely related. Although some species are general feeders, they usually have a preference for some one host ; the new habits having been probably brought about by the change of conditions when brought into new surroundings. The young would often be transported to strange plants, and a few might possess the power of surviving upon this unusual host, and consequently would set up a generation capable of living on this plant. This power of being able to change their food habits has a decided economic bearing. Insects of this group, which may be introduced for the first time into a country, may develop new food habits and, not having the natural enemies present which keep them in check in their native home, may become very serious pests. The scales which have become cosmopolitan, usually possess this power of existing on a large variety of plants.

As was noted above the female insects usually possess no power of locomotion, and must therefore spend their entire lives on the plant where they originally settled. The dissemination of the species must, therefore, take place with the young. Winds are probably a very important factor. A very strong wind could easily carry a very delicate insect like the newly hatched scale insect from one tree to another, and especially would a strong wind be able to tear away a large mass like the egg sac of the Australian Bug, and carry it a long distance.

Insects, birds and other small animals also act as transporters. It has been definitely proven that ladybird beetles which feed upon scales, may often carry the young, which have been attached to them, from one place to another. Doubtless many leaf-eating beetles do the same. The large black and yellow butterfly, known as the Orange Tree Butterfly (*Papilio demolius*), whose caterpillar feeds upon citrus trees, is also known to transport larval scales from one citrus tree to another.

Animals may rub off the eggs of young scale insects and carry them to new localities and the water in water furrows may carry them from higher to lower places in a field.

Although the above agencies may serve in disseminating these pests, probably the most usual method is by sending plants and trees from an infested area to a clean one. The spread of many scale insects over South Africa can be easily traced by searching out the records of shipments of nursery stock from unclean nurseries or from private individuals before there were any restrictions upon this business. An interesting case in point is the mussel scale of the orange, which occurs in only two or three parts of the Transvaal. This scale is very common in parts of Natal, and was carried from there on nursery stock many years ago into the south-east and eastern Transvaal. From the eastern

Transvaal it was afterwards probably carried on young trees into the central part of the Colony.

The conditions in a nursery are very favourable for the development of such pests as those under discussion. The young trees are planted close together so that the scales can develop undisturbed and the young can pass easily from one tree to another until the nursery, if not properly cared for, becomes a hot-bed of infection for the whole country.

Commerce is to blame for the distribution of scales from one continent to another. As a result of easy communication, it has become a common thing to introduce new fruits and plants into a country. With such introduction, unless carried on with proper care, may come many pests. Of the scale pests of citrus trees considerably more than half have been originally introduced to South Africa from oversea. Most of these pests have now become cosmopolitan through the results of commerce. Another method of dissemination is through infested fruit. Skins of fruit covered with scales might easily, if eggs or young are present, communicate the pest to a clean plant. It is a well known fact that scale insects are not extremely destructive in their native homes, but as soon as they are removed to a new locality where the old enemies and destructive agencies do not exist, the balance of nature is upset, and the insect becomes extremely destructive.

Climate has a great effect upon scale insects; extreme heat or cold may have a very detrimental influence upon them. In the cold climate of the northern hemisphere few scales develop in large numbers out of doors, while many will be found in greenhouses. The heavy frost which passed over the Transvaal during the past winter had a very beneficial effect in freeing many of the tender plants, both wild and cultivated, of their scale enemies, although in doing so it cut back the plants severely.

In cold climates the host plants are dormant throughout part of the year, so that the scales can develop only during the summer, and thus cause their life history to be passed through with considerable regularity. Most parts of the Transvaal, however, are very favourable to their development, and in many places they are able to breed throughout the year.

The humidity of the atmosphere also has a marked effect. Some species can thrive well only in a moist atmosphere, while others seem to do well in the driest portions of the continent, and many are able to adapt themselves to either condition.

Scale insects derive their nourishment by sucking the juice from plants. If they are present only in small numbers the loss to the plant will be hardly noticeable, but if they are present in large numbers, the plant may suffer severely. This is especially the case in a weak plant or tree; if healthy or vigorous it may succeed in overcoming the loss for a time at least. It is often the case, however,

that a citrus tree becomes so covered with these creatures that the fruit is of a very inferior quality, and it frequently happens that the tree dies back nearly to the roots as a result of the infestation. I have frequently seen oranges in the Transvaal so covered with scales that not a drop of juice remained in them, leaving them as hard as stones.

Some scales attack only the leaves and twigs, others are fond of the fruit, while many attack the trunk, stems, leaves and fruit immaterially. The leaves of some trees turn yellow or reddish about the scale, while some fruits discolour badly as a result of the puncture.

Many scales, such as the soft scale of the orange, produce a sticky, sweet secretion, which drops on to the leaves below. This furnishes a substratum, in which grows a dirty black smutty fungus (*Capnodium*). This fungus grows rapidly, and soon covers all the parts where the honey dew is present, giving the tree a very dirty and untidy appearance. But aside from this it covers all the breathing pores on the surface of the leaves, and thus interferes with the respiratory processes of the tree.

Armored Scales.

Of the armored scales infesting citrus trees the Red Scale (*Chrysomphalus aurantii*, Mask, Coloured Plate), often called California Red Scale, is by far the most destructive in the Transvaal, and probably the same statement would apply elsewhere. It increases rapidly, and is easily spread by birds, beetles and other insects, and animals and by cuttings, grafts and nursery stock and fruit. It is found throughout the world, wherever citrus trees are grown. Among its habitats the following are the principal countries :—Southern Europe, Syria, Ceylon, China, Japan, Mauritius, Australia, New Zealand, Samoa, Fiji, Hawaiian Islands, U.S.A., West Indies and South Africa.

The place of origin is unknown, but it is probably Southern Europe or Asia. Like all cosmopolitan scale insects its range of food plants is very large. Its favourite is citrus trees, next comes many varieties of roses, although, strange to say, some varieties of roses are never attacked. It is also frequently found on grape, apple, pear, privet, quince, loquat, guava, mulberry, apricot, English walnut, macrocarpa, willow, oak, elm, cyprus, cocoanut, fig, olive, plum and many ornamental plants.

In the Transvaal this scale is found in nearly every part where citrus trees are grown. It seems to prefer lemons and limes, next shaddocks, grape fruit and pompelmous, followed by oranges, and is least fond of naartjes. It is also very common on roses, and indeed this is a common source of infestation to clean citrus trees. Frequently roses are so covered that they die as a result. On a few occasions we have found it in small numbers on grape, loquat, plum, apple, guava, oaks and mulberry, but never in numbers enough to do the tree any injury.

It has been present for many years in the Transvaal, and was probably brought up from the coast in the very early days of the country, on young citrus trees. It attacks all parts of the trees, trunks, branches, twigs, leaves and fruit. When present in large numbers the foliage often turns yellow and drops, then the twigs and branches may die back, and in badly neglected orchards it sometimes happens that the whole tree dies. Trees in poor condition and not properly cared for always suffer worst.

A curious condition has come to my attention in several parts of the Transvaal. Formerly, before it was known how to treat this scale successfully, it frequently occurred that a tree became so badly covered with it as to die back nearly to the base. After this the scale was said to disappear, and when new shoots came up they were never attacked again. In other places there seem to be certain trees which for some reason are also exempt from attack.

The female of this scale is very small, circular in outline, about 1-12th inch in diameter, and of a yellowish red or brownish colour. The upper scale is flat, with a small nipple in the centre, and so thin as to show the body of the insect beneath. The insect itself is of a slightly crescent shape in outline, and this can be clearly seen through the scale by a darker area of colour (Fig. 1 and Coloured Plate). The under shield is thin and delicate, and of a whitish colour. The male shield is only about one quarter as large as that of the female, and elongate in shape rather than circular. Beneath this scale it developes into a two-winged insect (Fig. 1.).

The red scale is viviparous, that is it produces its young alive. For one day these young larvæ crawl about, then they settle down and begin to form a scale over their backs.

Several enemies exist in the Transvaal, among them several of our common lady-bird beetles, but none of them occur in numbers enough to be of any practical benefit. In the moist regions of the Transvaal, such as the Woodbush mountains, a fungus parasite of the red scale is quite common. This fungus, known as *Sphaerostilbe coccophila*, produces small red knob like growths over the infected areas. Although quite common in regions where suitable atmospheric conditions occur, it does not seem able to completely eradicate the scale even in such places. While considering it a useful ally, we must ignore its presence in combatting this pest.

Owing to the rapidity with which it developes, and the ease of transmission, there is no such thing as the eradication of this pest, but it can easily be kept under control. As the scale is very thin and the young are produced alive fumigation with hydrocyanic acid gas is most effective if the practise is continued at intervals of not more than two or three years. Several washes, such as resin wash and castor oil emulsion, or even paraffin emulsion, are very effective, although the latter is not as good as the former two, but must be applied thoroughly to be effective. All sources of infection, such as rose trees near an orchard, should be removed. If a tree is very bad, and is not of some

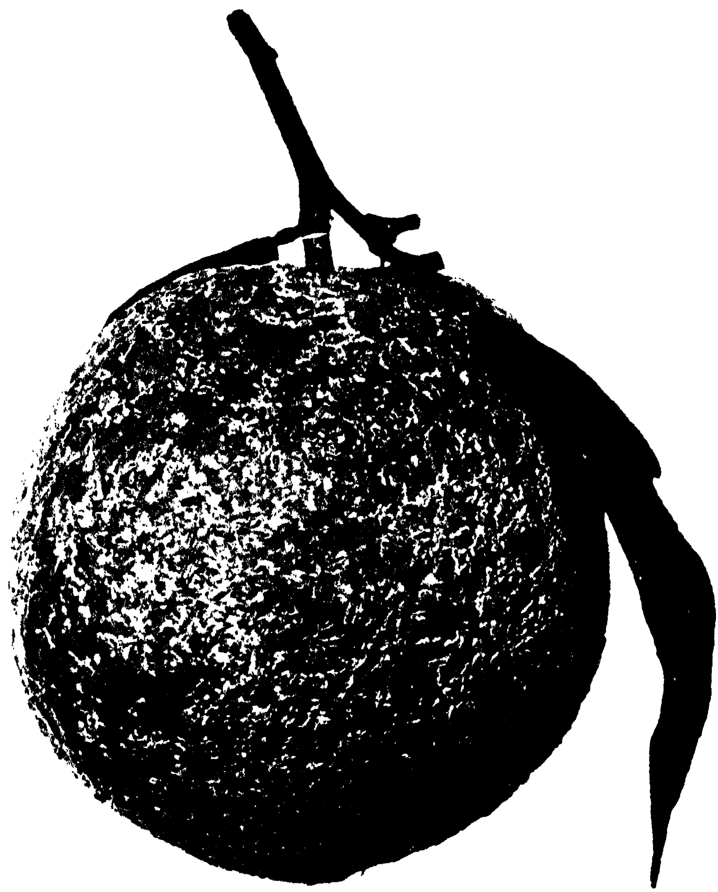


Plate 22.

The Purple or Mussel Scale.

(*Lepidosaphes beckii*, Newm.)

Found in the Eastern and South-Eastern Transvaal.

special value, probably the best remedy is to cut it down and burn it. When the scale is once under control it can easily be kept there.

FLORIDA RED SCALE (*Chrysomphalus aonidum*, Linn).

This species (Coloured Plate), often called the circular purple scale, resembles the common red scale in shape and size, being circular in outline. Instead of being thin and nearly transparent, however, the scale is very thick and of a rich deep purple or brownish colour, often nearly black, with the centre of a bright orange or reddish colour. There is no under scale. The male scale is about a quarter of the size of the female, and elongate in outline. Young scales do not possess the red centre spot found in the adults. It also has a very wide range of food plants ; oranges and naartjes seem to be the favourite, but it also attacks lemons, grape fruit, cocoanut, banana, rose, palm, guava, ilex, camellia, rhododendron and several other plants.

As to distribution, it is cosmopolitan, but seems to prefer moist climates. In America it is commoner in Florida than in California, probably due to the climate of the former being more humid. In Natal it seems to prefer the coastal belt, while in the Transvaal it is found mostly in the low veld along the eastern borders, and in the drier parts it is often found upon palms in green houses.

The leaves and fruit are the portions of the trees preferred, although it may occasionally be found on the branches. Infested leaves often turn yellow in colour.

The female is oviparous, that is produces eggs and not the living young. For this reason it is not quite so easy to combat as the ordinary red scale. But owing to the incomplete covering of the scale fumigation is effective, as also are the washes mentioned for the red scale.

PURPLE OR MUSSEL SCALE (*Lepidosaphes beckii*, Neum).

This scale is often associated with the preceding scale, and is confined to the same warm humid areas in South Africa. In the Transvaal it is found mostly in the eastern and south-eastern parts. It is also a cosmopolitan pest. It attacks all citrus fruits, but is most at home on the orange, naartje and varieties of citrus fruits with large oil cells. It is also sometimes found on fig, croton oak and many plants belonging to the family *Rosaceæ*, but in the Transvaal seldom on other than citrus trees. (Plate 22.)

Leaves and fruit are the parts mostly attacked, although stems may be affected at times. This scale and the following differ notably from the other two armored scales. Instead of being round the scale is shaped somewhat like an oyster or mussel shell, being about three times as long as its width at the widest part. It is of a dark brownish or purplish colour, and usually slightly curved. The under scale is delicate and cleft down the centre in the latter half of its extent. The front portion of the scale is occupied by the insect while the large white eggs are deposited in the latter part, each female averaging 45 eggs.

The male scale is less than half as large as the female, and is marked by a prominent hinge near the lower extremity, which allows a portion of the scale to lift up at the time of the emergence of the winged male insect.

This scale is a very serious pest, and, owing to its structure, that is, the thick scale tightly covering the mass o feggs, is very difficult to combat. Neither gasses nor sprays are thoroughly effective, except when scales are young. After oviposition begins it is very difficult to apply anything which will kill all the eggs at once. Fumigation must be repeated two or three times, with an interval of three or four weeks between each application. The expense is, however, very great to do this, and a cheaper remedy is to fumigate once, followed by a spray of resin wash or castor oil emulsion in winter, or paraffin emulsion in summer. Good cultivation with proper pruning will also help by making the tree more vigorous and able to withstand the injury done by the scales.

Long or Glovers Scale (*Lepidosaphes gloverii*, Pack).

This scale was first noticed in the U.S.A. and named after Glover, the Entomologist, who first wrote about it. Superficially it resembles the mussel scale somewhat, but is much more elongate and narrow (Coloured Plate). The female scale is nearly straight, but when it occurs in crowded masses is often slightly curved. The male scale is smaller and of brighter colour than the female. The under scale appears like two flanges from the sides, which do not meet in the centre line.

It is widely spread throughout the world, but is a serious pest, like the mussel scale, only in humid regions. In South Africa it is not very common, being found in the Transvaal, so far as I know, only at Warmbaths.

Among the citrus fruits it seems to prefer lemons and limes, and in other countries is sometimes found on palms and other ornamental plants. In the Transvaal we have found it only on lemons. The same remedies are effective as with the mussel scale.

Circular White Scale (*Aspidiotus hederæ*, Vall).

This scale is often known as the oleander scale, because of its great liking for that plant. It frequently occurs as a pest of citrus trees, but has only once been reported as such in the Transvaal. In Natal it frequently attacks rough lemons. In Southern Europe it is a very common pest of lemons.

The scale is nearly circular in outline, 1-12th of an inch in diameter, of a white or buff colour, with a reddish or yellow nipple in the centre. The scale of the male is smaller and slightly elongate. Fumigation and spraying are effective remedies.

The Soft Scale.

(*Coccus hesperidum*, Linn.)

Found in nearly all parts of the Transvaal where citrus trees are grown.

Unarmoured Scales.

We now come to the group of unarmoured scales. These have no covering such as members of the previous group possess. The development from larva to adult is simply one of growth. The young have six legs and move about for a while, finally they settle down, and in many cases lose the power of locomotion ; the body swells up and often becomes parchment-like as it increases in size. The eggs are deposited beneath the body of the female. In other cases the female may secrete a cottony sac at one end or above the body in which the eggs are deposited.

Soft Scale (*Coccus hesperidum*, Linn).

This is again a scale of very wide distribution over the world, being reported from its original home, Europe, and also from Algeria, Japan, Australia, New Zealand, Chili, Hawaiian Islands, North America and South Africa. It also infests many trees and plants beside citrus, among which are myrtle, ivy, holly, mimosa, laurel, box, oleander, camellia and many other ornamentals.

In the Transvaal I have only found it on citrus trees, of which it often proves a serious pest. Only old scales are found on old growth of the trees, the young ones (Plate 23) always migrating to the new growth, where they settle in large colonies on the stems and leaves, but never on fruit. Few plants ever succumb to its attack, but their growth is seriously retarded. At the end of the growing season the females are mature, produce the eggs and die.

The scale when fully grown is 3 to 4 mm. (.12 to .16 inches) long, elongate, oval in outline, nearly bilaterally symmetrical, with a deep cleft at the rear end. On the sides are two pairs of slight indentations, marking the openings of the breathing pores, while at the anterior end can often be seen two black spots, the remnants of the eyes. At this period the scale is only slightly raised along a line extending lengthwise down the centre, while a flat flange around the edge fits close to the plant. In colour it is pale yellowish or faintly greenish, nearly transparent, with irregular brown spots scattered over it. As it matures and eggs are formed it becomes more convex, and of a uniform dark brown colour with smooth and shiny surface.

This scale is badly parasitised by a small chalcid fly, which resembles a small wasp, and causes the scale to swell and turn dark coloured. The caterpillar of a small moth also feeds on it as do also several species of lady-bird beetles. If it were not for these parasites it would probably be a much more severe pest in South Africa.

A honey dew is also secreted by this scale, and for that reason it is often protected by ants. Many people make the mistake of thinking that the ants which they frequently see on sickly trees are the cause of the trouble. If they would take the trouble to look closely they would probably find either the soft scale or the orange aphis present. Both insects secrete honey dew, a food of which the ants are very fond.

The ants are only indirectly injurious to the trees in that they protect these insects by carrying them from tree to tree, or possibly by caring for the eggs during unfavourable periods.

The black smutty fungus referred to in the beginning grows in the honey dew, and is slightly injurious to the tree by interfering with the respiration.

Fumigation, if done when the scales are young, and before they have begun to produce eggs, is very effective in destroying them. After oviposition has begun it is of little use, for although the adult insect may be killed, the eggs are so tightly packed beneath the body that many will escape destruction. Sprays of resin wash or castor oil emulsion are effective if applied in winter. Paraffin emulsion is a good summer spray, an alternative being soap and water, 1 lb. to two gallons of water.

Black Scale (*Saissetia oleæ*, Berm).

This scale is also of nearly world wide distribution, and is found on a great variety of plants. It is frequently a pest of citrus trees, and closely resembles the soft scale in method of attack, etc. It is, however, very slow of development, prefers a moist climate, and is very highly parasitised by other insects. For this reason it is seldom a serious pest, and in most parts of South Africa is kept in check by its enemies. In the Transvaal it has only been reported once. The scale is short, oval in outline, of a dark, almost black, colour, and very convex. Down the centre is a sharp, longitudinal ridge, crossed by two transverse ridges forming the letter H.

It also secretes a honey dew, which is accompanied by the black fungus. The same remedies can be employed as for the soft scale.

* * * *

The Australian Bug (*Icerya purchasi*, Maskl).

The Australian Bug, often called in South Africa the *Dorthesia*, is most conspicuous when the white egg sac is present, and can easily be recognised by a glance at Fig. 2.

The female insect is a flat, elliptical creature of a dark orange or brownish colour, with black appendages. The back has a coating of a whitish or yellowish mealy substance, with a fringe of white waxy filaments about the margins. When it is mature it secrets from the anal end a large white, fluted, cottony sac, in which the eggs are deposited.

The Australian bug attacks a great variety of trees, but is found most commonly in the Transvaal on roses, wattle and citrus trees. It has had a very interesting history, having been imported on living trees from Australia into many other parts of the world. It at one time threatened to destroy the citrus industry of California, and it was through investigations upon this insect that the methods of fumigation with hydrocyanic acid gas and the spray of resin wash were developed. Eventually the famous Vedalia Beetle was found in Australia, where

it feeds upon the bug and keeps it in check. It has since been imported into countries where the Australian bug had spread and succeeded in keeping it in check.

In the Transvaal the Australian bug cannot be considered a serious pest. It is seldom that it occurs in numbers large enough to cause much damage. The vedalia beetle is present in many parts, as well as several other beetles which seem to prey upon it, and these seem to keep it under. If it should become abundant, however, and no vedalia is present, all infected portions of the trees should be cut out and burned, or the insects crushed or rubbed off with an oil rag ; a spray of paraffin emulsion is also effective.

* * * *

The Mealy Bug.

We often find in angles of the branches or at the bases of the leaves, masses of a white colour and mealy consistency. These are masses of mealy bugs. Those found in the Transvaal have never yet been determined, and may be an imported variety. In Natal two native species attack the citrus trees. The insects are of fairly large size, elliptical in outline with a row of tooth like filaments about the edge, and often several long, hair-like processes at the rear end. The whole body is covered by a mealy white powder, and the eggs are deposited in a mass of cottony or mealy secretion.

It can easily be destroyed by resin wash, paraffin emulsion or castor oil emulsion.

Some Pests of Citrus Trees Nearly Related to Scales.

There are two pests of citrus trees in the Transvaal which are very abundant, and are closely related to scale insects. These are the Black Fly of the orange, or Orange Aphis belonging to the family *Aphidæ*, and the Citrus Psylla belonging to the family *Psyllidæ*.

Orange Aphis (*Siphonophora citrifolii*).

The orange aphis is a very small louse-like insect, nearly black in colour, which is found in masses on the young twigs of citrus trees. Both winged and unwinged individuals may be found at the same time, and in the same colonies. They are very similar, except for colour, to the aphis found upon peach and plum trees and on roses.

This aphis attacks the young twigs and leaves, sucking out the sap and thus retarding the growth and causing the leaves to curl. The reproduction is rapid, and the winged females are provided for the dissemination of the species, so that their powers of injury are quite large. They appear in the greatest numbers in the winter. At other seasons the heavy rains dash the insects from the trees and cause their death.

Fumigation kills the aphis, but if no other insects are present on the tree a spray of paraffin emulsion, resin wash or soap will keep the trees clean if repeated frequently. In summer no remedies are needed.

Orange Psylla (*Trioza* sp.).

This pest is very common in nearly all parts of the Transvaal where citrus trees are grown, and seems to infest nearly all varieties of these trees. Its presence is easily seen by the peculiar crinkly appearance of the leaves. The eggs of the insect seem to be deposited along the edges of the young leaves which are just expanding. When they hatch the young ones crawl toward the centre on the under side, and wherever one settles and inserts its beak a deep pit is formed, giving the wrinkled appearance to the leaf. These larvæ somewhat resemble young scales in appearance, but have a fringe of white, waxy filaments around the edge of the body, and the dark coloured eyes are easily seen. From these finally emerge adult winged insects, which are very active, both at flying and jumping, and look not unlike a winged aphis. The adults are seldom seen.

It is only the young leaves which are attacked, although the pits are often present on the old leaves which were probably attacked when these leaves were terminal. The injury caused by the Psylla cannot be considered as very great. A certain amount of sap is extracted, and the respiration of the leaves is interfered with slightly, but not enough to class it as a serious pest. It does, however, make the trees unsightly, and young nursery trees are rendered unsaleable.

As soon as it is noticed that the pits are appearing on the leaves they should be picked off and burned. The larvæ also succumb readily to paraffin emulsion or soap spray, and also to fumigation.

Remedies.

1. *Fumigation.*—The process of fumigating citrus trees was fully described in the "Agricultural Journal" for April, 1907, and need not be repeated here.

2. *Sprays.*—Several sprays have been mentioned, the formulæ for the preparation of which may be of use. (See Appendix "A.")

* * * *

Appendix A.

Formula for Resin Wash.

Resin wash may be made up as follows:—

Resin	24 lbs.
Caustic Soda	5 lbs.
Fish Oil	3 pints.

With water to make 100 gallons of diluted wash.

As 100 gallons is a larger quantity than many would care to prepare, the proportionate amounts of the ingredients for smaller quantities are given.

For dilute wash containing:—

	50 galls.	25 galls.	10 galls.
Resin	12 lbs.	6 lbs.	2½ lbs.
Caustic Soda... ...	2½ lbs.	1¼ lbs.	½ lb.
Fish Oil	1½ bots.	½ bot.	¼ bot.

First crush the resin, which may be easily done by placing it in a meal sack and pounding it. Pour at least two-thirds of a gallon of water into the cooking vessel for every pound of resin to be used. add to the water the caustic soda and the oil, and bring these to a boil. Then stir in the resin and keep this mixture well stirred while the resin dissolves. If the

liquid boils over, add a small quantity of water, but never much. The mixture at first is milky, but when the resin dissolves it becomes clear and dark brown, not unlike strong coffee. The boiling need not continue over ten minutes when this point is reached and then water to bring the total quantity of the fluid above 21 gallons should be added.

The making of the wash is then complete.

This is a winter wash and should not be applied in summer when tender foliage is on the trees.

Castor Oil Emulsion.

Castor Oil	1 gall.
Caustic Soda	1 lb.
Water	1 gall.

These should be boiled together until thoroughly mixed, and if the quantities are too great smaller quantities in proportion can be used.

The stock solution should be used in the proportion of one part of the solution to from nine to fifteen parts of water, depending upon the tenderness of the plants to be sprayed.

Castor oil emulsion is a winter spray and should only be used when the trees are hardened off for the winter and no tender foliage is present. It forms a sticky coating which remains effective for a long time. For this reason it is of special value as a scalicide. Considerable quantities of dust, however, collects on trees sprayed with this solution until a heavy rain comes to wash it off, making its use for nurseries impracticable.

Formula for the Preparation of Paraffin Emulsion.

The paraffin emulsion is made up as follows:—

Hard Soap	1¼ lbs.
Paraffin	4 galls.
Water	2 galls.

Cut the soap into small pieces and boil until dissolved in the water. Add the boiling solution to the paraffin and at once churn the mixture, and keep it violently agitated for ten minutes, five minutes may suffice if a small hand pump is used to pump the liquid quickly back and forth. When it can be done without danger of the oil taking fire it is well to heat the oil beforehand, or to keep the mixture over the heat while it is being agitated. A uniform milky emulsion is thus produced, which becomes semi-solid on cooling. When properly made the emulsion will keep for a long time. It is dissolved with nine to fifteen parts of water.

The water and the emulsion must be thoroughly mixed. Soft water should be used both in preparing the emulsion and in diluting it.

This is a summer spray, to be used when the foliage is tender. For scale and aphis the application must be repeated several times to be effective.

Soap Wash.

Soap	1 lb.
Water	2 galls.

Blue mottled, Sunlight or soft soap can be used in preparing this spray. It cannot be recommended for anything except aphis.

THE HORTICULTURAL SECTION.

THE JAPANESE PLUMS AND THEIR HYBRIDS.

By R. A. Davis, Horticulturist.

Japanese plums, so well known to-day all the world over, have sprung into prominence within the last twenty-five years. Apparently they were unknown or unnoticed by European and American horticulturists until 1870, when the variety now known as the Kelsey was introduced into California and purchased by Mr. Kelsey, of Berkeley. Later on it was named by Messrs. Hammon & Co., who propagated it on a large scale, "The Kelsey Plum," but this did not happen until 1884. The Satsuma and Burbank, both direct imports from Japan, soon followed, and also, a little later, Chabot, Botan, Shiro Sumomo, Red Nagate and others which have not proved sufficiently valuable to merit widespread distribution. The Burbank is not one of Mr. Luther Burbank's productions, but was named after him by Professor van Dieman.

With the introduction of these new plums came Mr. Burbank's opportunity for hybridisation and specialising, and he has availed himself of it to the utmost extent. Among the first of the hybrids to prove really valuable came the "Wickson," closely followed by many others, including Gold, Early Yellow, October Purple Apple, Royal, Chalcot, Combination, Bartlett, Climax, Royal, Santa Rosa and others. Work on similar lines was taken up in New Zealand and Australia, and we have from these Colonies a few kinds which are also worthy of notice, amongst them Lord Kitchener, Wright's Early and Federation.

The Prunus Simoni has played a large part in the various crossings which have been undertaken, and from this plum, of little value in itself in most parts of South Africa on account of its extremely shy bearing, have originated one or two of the very best of the hybrids. Simoni is not, however, of Japanese, but of Chinese origin. It is largely cultivated in its native land, and seems to possess good bearing qualities there, as its inclusion into nearly all the mysterious Chinese compounds known as pickles and preserves goes to show.

It is needless to say that with so much work being done in the introduction of new kinds, the number of varieties increased with great rapidity, and at the present time, nursery catalogues show, in some instances, lists containing no less than 50 different sorts of these plums offered for sale. Of this number comparatively few are considered worth planting in South Africa, and selection of the fittest has already eliminated many which are accepted as really good in

other parts of the world, for instance, Simoni, although not a Japanese strictly speaking, has proved quite useless in this Colony, as also have Willard, Gold and a few others.

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Out of the 33 varieties under test at the Experimental Orchard at Potchefstroom, the following have been noted as being most likely to prove profitable. Their bearing qualities and general suitability to our Western Transvaal climate stamp them as quite the best for planting in that locality. They are named in the order of ripening as nearly as possible, but, owing to occasional variations in this particular, the order given must not be regarded as being entirely applicable year by year. It is, however, approximately correct :—

(1) Chabot, Red June.
(2) Burbank, Abundance, Royal, Ogon, Shiro, Sumomo.
(3) Wickson, October Purple.
(4) Apple, Chalcot.
(5) Satsuma, Kelsey.

The season of ripening commences in mid-December and lasts until late in February in Potchefstroom, but, both in the warmer and cooler parts of the Colony, these dates would necessarily be modified. It may be of interest to give a description of the kinds mentioned, with some remarks as to the history of some of them.

Chabot, named also O. Hatankyo and Uchi Beni, is a deep yellow colour almost covered with light red and becoming quite dark on the side exposed to the sun ; flesh yellow of fairly firm texture, sweet and good quality ; bears generally a resemblance to the Kelsey only much smaller ; the tree has a fairly upright habit and is a good grower.

Red June, or Red Nagate, is similar in size to the Chabot, of a somewhat similar heart-like shape, dull red in colour, the skin covered with a thick bloom ; does not attain as deep a colour as the Chabot. Flesh yellow, sweet and good flavour. Tree has a spreading habit of growth, and both tree and fruit much resemble Burbank. The fruit, however, is smaller and ripens earlier.

Burbank. This is one of the most profitable plums in the Transvaal, having remarkable and regular bearing qualities ; both tree and fruit attain a large size, the latter frequently scaling 6 to the lb. Fruit nearly round, clear red, with slight bloom. Flesh yellow, sweet, and delicious flavour when thoroughly ripe ; stone small. Tree of remarkably vigorous growth with distinct spreading habit.

Abundance or Yellow Fleshed Botan. A large sized yellow plum almost covered with dark red and becoming very dark on the sunny side marked suture ; small stone. One of the best flavoured Japanese plums, but not a regular bearer of good crops. Tree an upright and good grower, but has the habit of leafing out in an irregular and unsatisfactory manner. It is not recommended for commercial planting.

Royal does better in the Transvaal than in Cape Colony, where it was originally introduced by Messrs. Pickstone. Fruit large, distinctly heart-shaped, yellow, with much red covering; has a fine bloom and appearance generally; flesh yellow, firm and sweet, tree a vigorous grower and fair bearer.

Ogon and Shiro Sumomo. These two plums are mentioned together on account of their similarity of fruit, growth, habit and time of ripening. There is so little difference between them that they might almost be classed as one and the same. In the eastern States of America the Ogon is known as a somewhat flattened large yellow plum not unlike a greengage in appearance. In South Africa this plum is termed the Shiro Sumomo, ripening a trifle later than Burbank, whilst the Ogon can only be distinguished from it by a slight point, and this is sometimes so faint as almost to be unnoticeable. Local nurserymen have further complicated nomenclatures by calling one or other or both "Japanese Greengages." The Ogon, the pointed one of the two, is slightly later than the Shiro Sumomo, and has sometimes a tendency to rot on the tree. Both may be classed as desirable fruits; skin pale yellow, flesh yellow and juicy, with good flavour and small stone. Tree a spreading habit with growth much resembling the Burbank.

Wickson, like the Royal, is one of Mr. Burbank's productions, and certainly amongst the best. It is stated to be a cross between the Burbank and Kelsey varieties, but the growth of the tree itself, which is strikingly like "Simoni," would lead one to suppose that strain is also represented. The fruit is of the largest size, and, when three-parts grown, turns from green to a beautiful creamy yellow, which, later, gives way to a rich carmine. It is of an elongated heart-shape with often a decided nose which has a habit of turning towards the suture side of the fruit. Flesh is rich, yellow, and luscious with small stone. The tree is a vigorous upright grower and regular heavy bearer.

October Purple was brought to South Africa from Australia, where it has the name of being one of the latest plums grown. It has departed from this habit in the Transvaal and now bears in the order named. The fruit is large, purplish in colour, and heart-shaped. Flesh yellow, and the tree generally, both in fruit and growth, is not unlike Burbank, from which it is probably descended.

Apple. Another of Mr. Burbank's creations introduced by Messrs. Pickstone into South Africa some ten years ago. The fruit is flattened, large and roundish, of a similar blood colour to the Satsuma, which it resembles to a certain extent. The growth of the tree is, however, of a willowy and straggling nature, making pruning most difficult. The first consignment ever sent to the English markets was despatched by the writer about seven years ago, and 20s. per case realised. Since that time it has been proved one of the most successful shipping plums. It is not, however, largely grown in this Colony.

Chalcot was introduced at the same time as the last-named, and is one of the handsomest plums grown. It is a large flattened plum not unlike the shape of a tomato, and much more like an apple than is the plum of that name ; of a bright reddish colour, turning to a deeper shade when fully ripe. The flesh is deep yellow, fairly firm and sweet and pit very small.

Satsuma. Blood or Suika Momo is of a dark red colour from skin to stone with a flesh which is juicy and well flavoured and small pit. The growth of the tree is vigorous in the extreme. The writer recently saw one tree on the farm of Mr. G. H. Meyer, at Piet Retief, capable of bearing 1,200 lbs. of fruit annually. Fruit is extensively shipped and is excellent for jam making and canning.

Kelsey. The latest ripening of all the Japanese plums, is also the largest and the best. The fruit is of a distinct heart shape, and, when ripe, has a rich dark red colour with sweet yellow flesh and a very small pit. The tree is an early bloomer, and bears also at a very early age. Growth is usually vigorous, but the wood is not thick and strong and thus needs careful pruning annually. It is an excellent shipping fruit, and has recently been dried to a large extent with good results.

The above-named kinds are those which experience gained on the Experimental Orchards of this Department has shown to be most generally suitable for our Transvaal conditions. It is rarely indeed that any fault has to be found with the bearing qualities of any of these varieties, but, during the present season, there have been a few which have proved unsatisfactory, not only in the Transvaal, but throughout the whole of South Africa. These are Wickson, Satsuma and Abundance. The first two mentioned have hitherto proved amongst the most reliable croppers, and their failure during the present season may be put down partly to the extremely wet season of last year, causing a large growth of sappy wood which was prematurely injured by sharp early frosts before it had time to mature, also to the prevalence of extremely high and hot winds during the period of blooming. The theory that lack of pollination was the cause of the failure of the crop is a mistaken one, firstly, because the whole of the varieties named have proved to be self-fertile, and, secondly, because even under the most favourable conditions for pollination, and where this is bound to have taken place in previous years, the trees are largely bare of fruit.

Most of the Japanese plums grow freely on ordinary peach stocks and especially so on the Transvaal Yellow, which has proved generally acceptable to all of them. It is not, therefore, necessary to go further in search of a suitable stock. It has been customary both in Cape Colony and Australia to make use of the Myrobolan, and, in some cases, the Marianna plum, for this purpose, and trees so worked are under test at the various Experimental Orchards of

this Division. So far, the effects of this working appear to result in smaller trees of slower growth than those on peach roots; at the same time, even larger crops have been put in, but the fruit is invariably smaller and, consequently, of less value.

The additional adaptability of our common peach to the wide range of soils on which plums may be grown in this Colony is, if it were needed, an additional incentive to its wide use as a grafting stock for all kinds of Japanese varieties. It may be remarked in closing that the original nomenclature of most Japanese plums is somewhat confused; this is only to be expected when one considers that, as is often the case, there may be two or three particular varieties all hailing from the same district, and each plum has perhaps been called after the locality from which it first came. With the naming of the hybrids this difficulty disappears, as each bears a distinctive, and, in most cases, concise appellation.

To sum up, the Japanese plums cannot compare with European varieties in flavour; they have, however, the advantages of being extremely hardy, regular bearers of large sized attractive fruit. The fruit sells on its appearance, and, when locally grown and put on the market in a condition bordering on ripeness, it is quite acceptable, and will eventually displace that grown in the Cape Colony, owing to the longer transport in the latter instance necessitating more immature packing and consequent loss of quality.

No fear of over-production need exist; any surplus of green fruit can be utilised for jam making and drying by means of evaporation.

AGRICULTURE IN AMERICA.

By William Macdonald, Ph.D.

No. III.

IN this paper we shall discuss, in the first place, the efforts which are being made in the United States to educate the farmer, and, secondly, the farmer's son. The foremost factor in the endeavour to enlighten the farmer has undoubtedly been the work of the Farmers' Institutes. And, in view of the vast importance of this subject and its amazing influence, we need not apologise for our attempt to sketch the rise and progress of this institution. For more than a quarter of a century the National Department of Agriculture, the Colleges, and the Experiment Stations had been quietly at work controlling disease, introducing new crops and better methods, sending out experts to the pathless prairie, plant explorers to the harvest fields of Russia, China and Japan, scattering tracts by the million through the mails of every State in the Union, and so preparing, if perhaps unwittingly, for the coming great revival. It came, and Agricultural America awoke to find herself face to face with a new and profound problem. It was, in a word, how to satisfy the clamorous demands of the plain man behind the plough for simple direct instruction in the latest methods of farm practice; and, at the same time, how to win as converts to the new religion, those thousand keen-witted, but so often unlettered, emigrants, who daily pass under the Statue of Liberty, press forward and ever Westward, to settle on the sunlit plains of the Dakotas, Kansas and Wyoming. Clearly a case of Mahomet and the mountain. If the unlearned colonist could not attend a college, then the college must come to him. And so arose those wonderful societies—or Farmers' Institutes—which are now held all over America, and boast a member's roll of more than a million mature men and women actively engaged in rural pursuits.

So also in Canada. For many years the Agricultural Colleges and the Experimental Farms had been busy at work teaching the youth of the Dominion and solving the larger economic problems, but it was only yesterday that a serious effort was made to help the farmer and his wife in their toilsome daily duties. The college had merely touched the fringe of the rural community. Take, for example, the famous Agricultural College at Guelph, in the Province of Ontario, with some 700 odd students in all classes. Now turn to the last census and you will find names of farmers to the total of 175,000. Thus it was clear to the Canadian authorities that something more had to be done to meet the real needs of the people. To-day, you may travel

through the length and breadth of the Old Dominion, and everywhere remark the permeating influence of those institutes established for the farmer, his wife, and his children.

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Curiously enough, in no two States are those institutes conducted in precisely the same way. For, in one State, you will find the management under a central board ; in another, each institute is simply an independent unit. And further. In some States these local bodies are under the common State laws, whilst in others again they have no legal status, being temporary and resurrected each year. This strange diversity is due to the fact that these societies are new. They have arisen spontaneously, in each of the several States, in many cases without plan or the finger-post of successful precedent.

Now, the first attempt to consolidate such various interests was made in the year 1896, first in the State of Wisconsin, and later in the city of Chicago. These meetings finally gave rise to an organisation termed the American Association of Farmers' Institute Workers. A year later, at Columbus, Ohio, a petition was presented to the Hon. the Secretary of Agriculture asking him to arrange for a Division in connection with the Federal Department of Agriculture to be known as the Division of Farmers' Institutes, and to appoint a suitable officer. This was done. And an official known under the rather cumbersome title of Farmers' Institute Specialist was accordingly appointed under the supervision of the Office of Experiment Stations. The Act providing for this post makes it the duty of this officer to : "*Investigate and report upon the organisation and progress of Farmers' Institutes in the several States and Territories, and upon similar organisations in foreign countries ; with special suggestions of plans and methods for making such organisations more effective for the dissemination of the results of the work of the Department of Agriculture and of the Experiment Stations, and of improved methods of agricultural practice.*"

Notwithstanding the marked difference in the management of these institutions, one dominant purpose was seen to be common to all, namely, an earnest effort to bring home to the rural community the supreme need of scientific agriculture by means of faithful and capable teachers who met the farmer, face to face, in the town hall, the school house, or on the verandah of the village store. At first, and with the small means at their disposal, the managers could only hold three or four meetings throughout the year. And, as might be expected, once the season was over, the farmers themselves settled down into a state of indolent repose. It soon became evident that a more sustained effort must be made to maintain these well meant but effervescent outbursts of energy. This led to an effort to reach the ruralist in every county by means of timely leaflets discussing such subjects as "Agriculture in the Rural Schools," the "Repair

of Public Roads," "Introduction of New Crops," and various homely tracts on "Domestic Science."

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Next, a word as to cost. These institutes are supported by State appropriations, local subscriptions, as well as by the help of the Agricultural Colleges and Experiment Stations. The amount spent varies from \$35 (£7) in the territory of Hawaii, to \$20,000 (£4,000) in the State of New York, and the total sum spent in this work is about \$250,000, or £50,000, while the average cost for each person in attendance during the session is about 2 cents (1d.). In the majority of the States the remuneration of the lecturers ranges from \$2 (8s.) per day to \$50 (£10) per week, with expenses; in a few States no compensation is given to the lecturers outside their necessary hotel and travelling expenses.

Furthermore, the lecture staff of this Farmers' Extension College is made up of the enormous total of some 50,000 persons who are employed by the State Directors of the institutes together with the local managers. A recent report issued by the Federal Department of Agriculture mentions that of 623 lecturers engaged in the Farmers' Institutes, 287 had college degrees, 4,138 had taken partial college courses, 108 had pursued the normal or high school curriculum, while 90 were practical men trained in the common rural school. It is thus plain that the men who compose the teaching staff of these institutes are fairly well qualified, and the progress in this respect is most remarkable when we recall the scanty knowledge of the average lecturer of ten years ago. The lectures are followed by an informal discussion of the various topics by the audience. These face-to-face talks are the distinguishing feature of the institute. Thus, any new theory is subjected to the frank and free criticism of practical men, many of whom have had a life-time of experience in the speaker's special subject. These men are quick to detect any unsound schemes, and this sharp discussion has driven the poor instructor from the platform and gradually secured for the institute service a corps of strong scientific debaters. It is hardly necessary to emphasise the untold influence of the agricultural expert who is able to demonstrate any new method when confronted by an assemblage of intelligent and progressive farmers. From that day they became the earnest advocates of his new ideas and his warm-hearted and never-failing friends.

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Moreover, in order that the teaching staff of the institute should be kept up to a high level of efficiency, some system had to be devised. The National Department of Agriculture has already made a move in this direction, and now sends out to each State lists of the publications issued by the Department from which they can select such bulletins as may be of use to them in the study of their several themes. Some of the States have gone further. Illinois,

Michigan, Minnesota, Wisconsin and New York have already inaugurated a general course of lectures for the members of the institute staff by the professors and instructors of the Agricultural Colleges and Experiment Stations. Formerly, the audiences at these conferences consisted chiefly of stalwart young farmers, grey-haired men and matrons, with here and there a farmer's boy or girl. And the programme, question-box and debates were arranged for older persons. It was not long, however, before the importance of doing something for the children of the farmer became manifest. In a recent address on Agricultural Progress, the Hon. C. C. James, Deputy Minister for Agriculture in Ontario, remarked: "Twenty years ago we discovered the farmer; five years ago we discovered that he had a wife; and now we are beginning to open our eyes to the fact that he has children." To-day, in many States, something is being done for the boys and girls of the farm.

A short outline of the system at present in vogue in the State of Illinois will serve as a fair example. Packages containing 500 kernels of some good sort of seed corn (mealies) are sent out by the State Superintendent of the Farmers' Institutes to all boys throughout the State who wish to enter for the contest. It is assumed that each boy shall plant, cultivate, harvest and exhibit not less than ten ears of corn at his home county Farmers' Institute, and, furthermore, that he will attend at least one session of the institute. The ten ears exhibited must be uniform in appearance and true to type. The judging is performed by persons selected by the local board of the institute, usually some one who has passed the Illinois Corn Growers' Examination for skill in corn judging. This contest is confined to boys under 18 years of age. Prizes are also offered for the best report on the proper method of growing the crop. The prizes given usually consist of some animal or article related to the farm, such as a well-bred calf, pig or lamb, a farm implement, a small but select library of agricultural books, a bunch of fruit trees, a collection of seeds. In some States an entire day is set apart, and is known as the "Boys' Day," and the public schools are closed to enable the teachers and children to attend the institute. These educational contests are often extended to many other crops. And surely, if the Farmers' Institutes have re-awakened the Agricultural Colleges, the Children's Institutes will go far to revivify the Rural School.

An eminent American writer, Dr. L. H. Bailey, of Cornell, somewhere remarks: "As nearly as I can estimate, from such data as I have been able to collect, not one farmer in four reads an agricultural book, an agricultural bulletin, or an agricultural newspaper. It is all well enough that the farmer thinks in terms of experience rather than in terms of books, but a sound reading-habit is essential to his progress and his success." Is it too much to hope that the Farmers' Institutes will effectually remove the Professor's reproach?

In order to better understand the inner workings of the Farmers' Institutes it may be well to discuss the methods in vogue in a typical State. It was with this end in view that we journeyed from the city of Minneapolis to the Coteau Farm—the home of Mr. O. C. Gregg, the Superintendent of the Farmers' Institutes—situated in South-Western Minnesota. The Coteau Farm, which was won from a treeless waste within our own memory, is now picturesquely planted with hardy frost-resistant species, and here in the summer-time you will find waving fields of golden grain, broad acres of rich clover, and huge stacks of sweet smelling prairie hay ; while the word itself reminds us of those stirring days when the power of France named even the rocky knolls of this trackless prairie, and sped her deathless explorers through the darksome valley of the Mississippi to plant her Lilies in the Great Lone Land beyond.

Now, it is noteworthy that the rise of the Farmers' Institutes was mainly the result of a movement which had for its aim the splitting up of the State University into separate departments. At that period a strong party throughout the State, and also in the legislature, advocated the division of the University because many people wanted a separate Agricultural College in another part of the State. Briefly, it was a question of Union or Secession. At this moment a man arose whose inspiring personality turned the tide in favour of the cause of educational Union. The name of this patriotic citizen was Mr. John Sargent Pillsbury, sometime Governor of the State, whose name and brand—inscribed upon those well-known bags of flour—must be a household word in most parts of the British Empire. This remarkable man was born in 1828 in the State of New Hampshire, but it was not until 1855 that he first saw the Falls of St. Anthony with which his name hereafter was to be imperishably connected. And we fancy that even in his wildest dreams the New Hampshire youth could scarcely have dared to divine that, in less than forty years, those rushing waters would drive his mighty mills and daily pour out thousands of barrels of snow-white flour with which to feed the hungry millions in every portion of the civilised globe. His statue adorns the campus of the University, and his name is held in high honour in Pillsbury's Hall. It was Pillsbury who first saw that to preserve the Union he must win the farmers to his side. It was Pillsbury who preached the gospel of consolidation —a single University—in season and out, to his fellow-millers of the twin cities, and his comrades in the State Legislature, and who, after many days, by reason of his winning manner and robust common-sense, won the loyal support of the sturdy farmers in the wheat fields of the Red River Valley. To-day the University of Minnesota stands a splendid monument to his far-seeing statesmanship. For it was the efforts of the farmers themselves, thrown into the cause of Union, that finally led to the University, the College of Agriculture, and the School of Agriculture, all being placed under one common educational system.

This placing of the Agricultural College under the University system has had a profound influence for good in America. The agricultural student bred in an independent college is too often a crude technical specialist, but, in mingling with his fellow students in the Colleges of Arts and Science, Medicine and Law, he acquires a wider culture and is mellowed in a larger learning. In place of a rigid self-satisfied specialist he emerges a humble scholar.

But to rightly understand this educational evolution we must go back to the middle of the last century to the time when a fierce fight was raging under the rival banners of industrial learning *versus* classical lore. And like the famous disruption of the Scottish Church, the issue led to a revolt, and the long-fought revolution culminated in the passing of the Land Act in 1862, which made provision for the establishment of Colleges of Agriculture and Mechanic Arts. New colleges, separate, independent and free, were established all over the land, and very soon became much richer and more progressive than the old. But, although these new institutions did much good work they lacked something. It was culture. And it was not until they were re-united to the Universities from which they had been so long estranged that they may be said to have attained to true scholarship. In Union both have found a better and a fuller life.

Moreover, it is worthy of note that the most recent of the great Agricultural Colleges—the Macdonald Agricultural College in the Dominion of Canada—has been affiliated with the McGill University of Montreal. Furthermore, as Professor Bailey truly remarks in his masterly survey of "The State in Relation to Agriculture": "The time will soon be, if it is not already here, when a University that is a University must include Agriculture if it is to meet the problems of the people." And, again: "I like to say to my classical colleagues that this new education has even put a new attitude into much of their own teaching, and that they would at once feel its loss if it were withdrawn."

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To return to the State of Minnesota. As the students failed to attend the agricultural classes of the University, Professor Porter conceived the idea of going out amongst the farmers and holding meetings in their midst. This was the beginning of the University Extension movement. Meanwhile, Mr. O. C. Gregg had begun to hold little institutes of his own at the annual fairs—convened in the open air beside the cattle shed—and the theme was dairying. At first the audience consisted of the speaker, the cow and the "hired man" who held the cow. But, little by little, the listeners came and the tidings of these revival meetings reached the ears of Pillsbury as he sat in his office in the Capital brooding over the still unsolved problem of practical agricultural education for the farmers of the State. The Governor sent for Mr. Gregg and asked him if he would

assist in establishing Farmers' Institutes throughout the entire State with the title of Superintendent.

These institutes begin work in December and close in March, while the summer session starts at the end of May and finishes in July. The winter institutes usually cover two days and the summer session—being the busy season—just one. There are eighty counties in the State, and an effort is made to hold at least one meeting in every county throughout the year. These meetings are advertised three or four weeks in advance of the session. The press and tradesmen, the schools and churches, all assist in freely advertising the institute. The present staff consists of a Superintendent and ten or twelve instructors. At first, as might be expected, there was great opposition to these institutes and much pioneering work had to be done in order to combat existing prejudice. The Salvation Army methods employed attracted curious crowds. Nevertheless, in spite of much ironical criticism, this plan was what really made the institute a success. Cattle, sheep, and pigs were judged, and horses trained and broken before an appreciative assemblage that often blocked the public thoroughfare.

And now let us take our seats in one of those farmers gatherings. The hall is usually crowded long before the hour of opening, and the meeting starts promptly at ten o'clock. We may assume that the three subjects chosen by the Superintendent for the forenoon discussion are: Dairying, Domestic Science and Swine Husbandry. On the four walls are pinned huge charts, drawings and sketches illustrating types of dairy cattle, food-stuffs and breeds of swine. The speaker on dairying has at his side a milk tester, a cream separator, and a butter worker to better explain his subject, and addresses the meeting for perhaps twenty minutes, and may be interrupted by questions from any one of his audience. Next, the lady lecturer on Domestic Science, with stove and cooking utensils, proceeds to prepare some part of a dinner or bake bread before an admiring and critical audience. This work has been the precursor of those admirable courses in Home Economics and Domestic Science which are now given at all the great Agricultural Colleges. Finally, the expert on that subject of never-failing interest "The Hog," takes the floor and challenges a crowded room to free debate. Reading from manuscript is not permitted at these meetings, and, naturally, the discussions are often of a most lively description. At noon the "Question Box" is placed upon the platform and all queries are answered, if practicable, before the afternoon session; the "Institute Annual" is also distributed at this hour to all who ask for it. The farmers then adjourn to the street where the institute expert demonstrates the merits of the dairy cow or the bacon hog. At the larger centres a thousand farmers are often found eagerly following these lectures, and many come from afar—10 to 20 miles away—driving in the early morning when the thermometer is many degrees below zero.

The influence of the institute upon the agricultural industry has been felt in many ways. The most notable example is the rise of the dairy industry to the conspicuous place which it now holds. This has been largely due to the Farmers' Institutes instructing the people at their own homes—by means of the field dairy—in the care of cream and the making of butter; the swine industry has likewise been fostered, while the improvement in field cultivation is enormous. Corn and clover have been introduced into many parts of the State where before it was said these crops would never grow, and a silo has been erected on almost every farm. But, more important than all these, the institute has taught the farmers of the State to take a pride in their University, in their College, in their School of Agriculture, and in their Experiment Station; and the most cordial good feeling now exists between the State educational authorities and the prairie farmer.

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Let us now turn to the second part of our paper and ask what is being done for the son of the American farmer. It is plainly impossible, within the short scope of this paper, to do justice to those sixty-five Agricultural Colleges, with their sixty thousand odd students, which have been founded and fostered by the passing of those wise Acts of Congress, and which are imperishably linked with the names of Hatch, of Morrill, and of Adams; and still more nobly endowed by the princely benefactions of the American people: but amongst those many remarkable institutions there is one which calls for more than a passing mention. For it stands at the gateway of the east and the west; and has become the corner stone of the new agriculture. We speak of Cornell. The history of the rise of this remarkable College is a romance of the past half-century: we know the story of the life and work of the founder will appeal with special force to our farmers; and, perchance, it may excite the patriotic interest of our fellow-citizens of wealth and power. In any case it will be of advantage to set down a few of the more stirring phases in the history of this Institution which might well furnish, we venture to believe, a worthy model for the new Agricultural College of our own great State.

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Less than a year ago the centennial of the birth of Ezra Cornell was celebrated in the quiet town of Ithaca by the waters of Lake Cayuga with due pomp, enthusiasm and befitting dignity. The orator on this notable occasion was Mr. Andrew Carnegie, and few men, we imagine, could more graphically depict, in plain and homely language, the industry, the courage, and the rare fortitude of the poor Quaker lad who, in later life, became a millionaire.

The founder of the University of Cornell, the eldest of eleven children, was born at Westchester Landing in the State of New York on January 11th, 1807. His father, a Quaker, sprung from the sturdy race of Puritans, reached the great age of 91, and his son inherited his

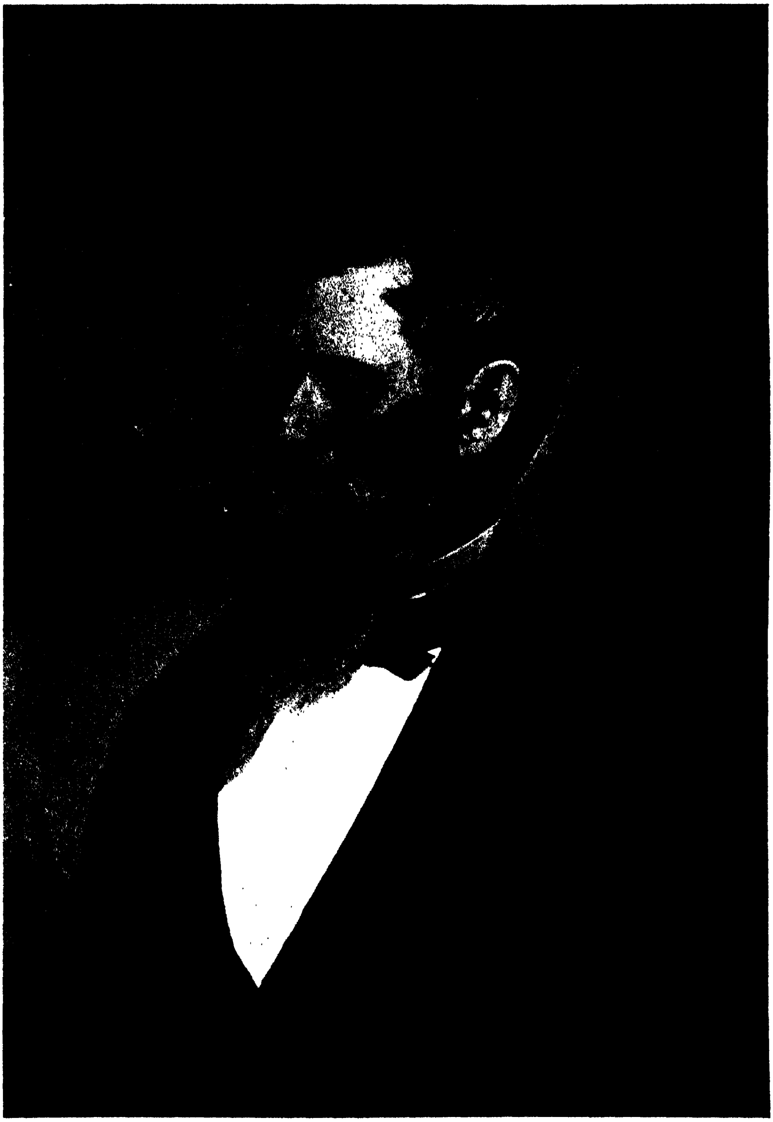

Plate 24.

Ezra Cornell.

Founder of the University of Cornell.

Born 1807: Died 1874.

superb constitution. The humble village school was Ezra's only college, and the historian records that he was distinguished by a consuming thirst for knowledge. At the age of sixteen he and his brother entered into a contract for the clearing and planting of four acres of land in order to be permitted to attend school during the winter term. A year after Ezra was ranked as master builder, having planned and erected a two-storey frame house for his father's family. He then left his home and started work at Ithaca—a promising trading point connected with the Erie Canal—where he toiled assiduously until trade grew dull. Cornell was then in his thirty-sixth year.

Always interested in mechanical inventions he purchased the patent rights for the State of Maine and Georgia of an improved plough, and while visiting Maine he met a certain Mr. Francis O. J. Smith, member of Congress and the editor of the "Maine Farmer." A friendship was formed between the two men, and not long after Cornell took the chance of visiting his friend, walking 260 miles in six and a half days. Cornell's account of what happened when he called upon his friend Smith is worth recording :—

"I found Smith on his knees in the middle of his office floor with a piece of chalk in his hand, the mold-board of a plow lying by his side, and with various chalk-marks on the floor before him. He was earnestly engaged in trying to explain some plan or idea of his own to a plow manufacturer, who stood looking on with his good-natured face enveloped in a broad grin that denoted his scepticism in reference to Smith's plans. On my entrance Mr. Smith arose and grasping me cordially by the hand, said: 'Cornell, you are the very man I wanted to see. I have been trying to explain to neighbour Robertson a machine that I want made, but I cannot make him understand it,' and proceeding he explained that he wanted a kind of scraper or machine for digging a ditch, that would leave the dirt deposited on each side, convenient to be used for filling the ditch by means of another machine. 'It is for laying out telegraph pipe underground. Congress has appropriated $30,000 to enable Professor Morse to test the practicability of his telegraph on a line between Washington and Baltimore. I have taken the contract to lay the pipe* at $100 per mile, and I must have some kind of a machine to enable me to do the work at any such price.'"

Cornell stooped down and with the chalk sketched a rough diagram of a machine which would do the work in one operation. The invention proved a success, and he was employed not only to make the ditch digger, but also to lay the pipe.

From the day he touched the telegraph Cornell never once looked back. With superb faith he plunged into the work of raising capital in the face of tremendous opposition. He built a short line to Boston and then set to work to develop his great western system ; and ere long Buffalo was flashing messages to Chicago. Then came his connection with Pennsylvania ; and Mr. Carnegie relates that the first thing he saw on entering the town of Pittsburg, himself a poor lad just out from Dumfries, was the erection of Cornell's telegraph poles, in June, 1844. This led to the formation of that great corporation, probably the first Trust in American history—the Western Union Telegraph Company. It was consolidated by Cornell. He invested all his savings in this one concern, and sometimes he had no money to meet current expenses. But his faith was fully rewarded : at the age of

* Morse's first intention was to place the telegraph wires in leaden pipes buried in the earth ; but he finally decided to suspend the wires on insulated poles in the air.—(AUTHOR.)

fifty he found himself in the possession of a vast fortune—over two million dollars.

His first gift to his native town was a Free Public Library. But the love of the farm never left Cornell. And so, in the year 1857, he returned to the plough, and purchased a fine estate adjoining Ithaca, which he turned into a Model Farm. His fellow-citizens elected him to the Senate of New York ; made him President of the State Agricultural Society ; and a Trustee of the new Agricultural College, which was then located in Seneca County. And here hangs a tale. Cornell found the College sadly inefficient, and in need of funds, so he straightway proposed to endow it with what was, in those days, a prodigious sum, namely, $300,000, provided it was removed to Ithaca ; and, further, that New York should endow it with one half the College Land Grant which congress had voted to every State.

At that moment there happened to be in the Senate a man who was destined to become the first President of the University of Cornell, and whose name is indissolubly linked with the history of the University. This was the Hon. Andrew D. White, for sometime American Ambassador at Berlin. Mr. White strenuously opposed Cornell's scheme, and insisted that the grant should not be divided, but kept entire to found a University worthy of the whole State. Cornell was converted to his friend's idea ; and next session he increased his offer to half a million dollars provided a new institution were established and endowed with the whole land grant. This offer was finally accepted by the State though, curiously enough, Cornell was required to pay the sum of $25,000 for the privilege of presenting his half million of money, a sum which, we are happy to say, the State later refunded, and which Cornell immediately handed over to the University. Cornell then gifted, free of cost, his Model Farm, which is the present site of the Campus of the University.

Of the many notable triumphs of this daring mind there is one which stands out an illuminating example of indomitable will, rare foresight, and abiding faith. We refer to Cornell's action in dealing with the land grant problem.

In the year 1862 Senator Morrill, of Vermont, brought in a Bill under which Congress granted certain public lands in the Far West to every State in the Union : and the proceeds of the sale of this land—or land scrip, as it was then called—were to be used to form a perpetual endowment fund for the establishment and maintenance of one or more colleges in each State where instruction might be given in agriculture and mechanic arts, not excluding liberal studies, and embracing military tactics. The share of the State of New York was nine hundred and ninety thousand acres. In many States this land scrip was at once thrown upon the market, with the result that the price fell to 30 cents per acre.

To Cornell, dreaming of the project which he formulated in those memorable words : "*I would found an institution where any person can find instruction in any study*"—this splendid land endowment fund

Plate 25.

The University of Cornell.
(Ithaca, New York.)
Showing the Campus and Lake Cayuga.

was simply being thrown away. Nearly one-fifth part of those 990,000 acres had already been disposed of by the State when Cornell stepped into the breach. He volunteered to take over all the unsold land at 30 cents per acre—thus guaranteeing the State against loss—and to hand over the profits to the University. At one time he had over $700,000 so invested, more than two-thirds of his entire fortune. The trustees of the University were alarmed, and urged immediate selling. His best friends remonstrated. But Cornell stood firm, and the final result was that he made the then enormous sum of more than $5,000,000 clear profit, which constitutes the University's main endowment. His next enterprise was to bring in two railways to Ithaca, from the large centres of population, in order to put an end to the isolation of the college. When urged to rest he quaintly replied that he wished to make another million out of the railroads for University endowment. Cornell died from pneumonia on December 9th, 1874, in his sixty-seventh year.

* * * *

It has been well said that the most striking trait in the character of Cornell was his remarkable foresight and absolute faith. He was sanguine with regard to the ultimate future of America ; he had faith in her destiny. Hence his unfaltering belief in the telegraph, in the railroad, and in the vast potentialities of land. And, lastly, he had faith in his University. At the opening ceremonies, standing upon the bare hillside in the mud and the rain, by the side of the first lone building, he made the daring and prophetic remark in reply to an unkind critic : "Gentlemen, we have not invited you to see a University finished, we have invited you to see a University begun. There are those living who will see 5,000 students on yonder University grounds." Forty years have not yet passed since those words were spoken in the presence of Cornell's life-long friend ; and the Ambassador to Berlin must have felt a thrill of pride at the recent centennial celebrations when he looked over the latest register roll and noted a total of 4,500 students. Nor can we better close the career of the Quaker lad than with those simple but glowing words used by the Hon. Andrew D. White in his commemoration address :—

"At this hundredth anniversary of Mr. Cornell's birth his work is but just begun. The time will come when his statue will stand on this hill, in the midst of the old farm which he loved so well ; centuries hence his name will be honoured here ; and countless generations of students will do him just homage as one who rose above the selfishness of his time and lived for his fellow men."

* * * *

It is worthy of note that from the first the University of Cornell placed all studies on the basis of perfect equality. Previously, but little attention was paid to any subject not bearing upon classics and theology. In those days even in the more advanced colleges students

who pursued courses in applied science were carefully segregated from the rest, and were not permitted to receive their diplomas at the same time, or in the same place, lest they should contaminate the consecrated font of classical culture. But Cornell shook off the shackles of the old scholasticism, spurned sectarian control, and stood free. It was the first modern University to allow the student freedom in the choice of his studies in place of the former cast-iron curriculum. Moreover, by means of free State Scholarships it has united the common school with the higher learning. Thus it is possible for a poor but industrious scholar to pass from the infant school to the postgraduate department ; or, in other words, to follow a course of some twelve years of continuous study without having a cent to pay. In 1872 Cornell threw open her doors to women students, and since that time co-education has been the rule.

* * * *

It would take too long to discuss in detail the curriculum of Cornell, and we propose to confine our concluding remarks to the work done and the courses offered in the College of Agriculture. But, in passing, it may be well just to name the several Colleges now grouped under the University. They are as follows : The College of Arts and Sciences, College of Law, Medical College (New York City and Ithaca), New York State Veterinary College, New York State College of Agriculture, College of Architecture, College of Civil Engineering, Sibley College of Mechanical Engineering and Mechanic Arts. Besides these, there is the Graduate Department with 421 students, and the Summer School which numbers over 800. The ordinary undergraduate courses cover four years—except in the case of Law and Veterinary Science, which require only three—and lead to the degree of Bachelor. The degree of Master is granted after one year of satisfactory post-graduate work, while the degree of Doctor requires three years of graduate study and residence. Cornell does not grant honorary degrees. In the Colleges of Arts and Sciences and Law the annual fees are $100 (£20) ; in the Colleges of Medicine and Engineering $150, or £30. It is interesting, however, to note that tuition is free to students with State Scholarships, to students pursuing the prescribed course in Agriculture and intending to complete that course, and to special and graduate students in Agriculture taking at least two-thirds of their entire work in the College of Agriculture. Cornell is a cosmopolitan University. According to the latest geographical census her students come from forty-seven States and thirty foreign countries. China sent 15, Japan 6, and Russia 4.

At the outset it may be well to define the functions of a modern Agricultural College. In the early days those Colleges were intended simply for instruction in applied Agriculture and the allied sciences. But the vast change that has come over agricultural education since the founding of the first college at Langsing, half a century ago, is lucidly shown in that act of administration of the Cornell College of

Agriculture* which has signed by His Excellency the Governor on the 12th April, 1906, and which reads thus :—

"The object of said College of Agriculture shall be to improve the agricultural methods of the State : to develop the agricultural resources of the State in the production of crops of all kinds, in the rearing and breeding of live stock, in the manufacture of dairy and other products, in determining better methods of handling and marketing such products, and in other ways : and to increase intelligence and elevate the standards of living in the rural districts. For the attainments of these objects the College is authorized to give instruction in the sciences, arts, and practices relating therero, in such courses and in such manner as shall best serve the interests of the State : to conduct extension work in disseminating agricultural knowledge throughout the State by means of experiments and demonstrations on farms and gardens, investigations of the economic and social state of agriculture, lectures, publication of bulletins and reports, and in such other ways as may be deemed advisable in the furtherance of the aforesaid objects : to make researches in the physical, chemical, biological and other problems of agriculture, the application of such investigations to the agriculture of New York, and the publication of the results thereof."

It will thus be seen that the New York College of Agriculture concerns itself with education, trade, transportation and all those agencies which aid in making the farmer a more efficient producer and a more effective citizen. In a word, it is designed to train lads for country life or the open fields as distinguished from an education fitting them for the city or the more or less congested centres.

The College of Agriculture was founded by the Land Grant Act of 1862, while Cornell University was incorporated by the Legislature of the State of New York, three years later, and opened on the 7th of October, 1868.

The College is provided with land, live stock, buildings, orchards, gardens, libraries, machinery and other equipment. The farm comprises nearly 250 acres, and over 500 students are in daily attendance. Here it may be remarked that the entire farm area of the University of Cornell is being laid out as part of the University domain—campus and farms being developed in harmony and along artistic lines. Cornell realises that her students may, in later life, become missionaries in preserving natural scenery and in assisting in the good work of village improvement.

In the College of Agriculture you will find three great departments : the Academic or Teaching Department ; the Extension Department ; and the Research or Experiment Station Department. The Academic Department comprises the regular instruction, and consists of a four-year course leading to the degree of Bachelor of the Science of Agriculture ; but students may also pursue agricultural subjects in the Post-graduate Department of the University leading to the degree of M.S. in Agriculture and Ph.D. The purpose of the Extension Department is to carry practical science to the farming population beyond the University—a work maintained by funds derived from the State. The third, or Research Department, which controls the Experiment Station, is supported by grants from the Federal Government.

* The new buildings of the College of Agriculture cost $250,000.— (AUTHOR.)

Let us briefly review the field of the first Department. The work in the four-year course is both prescribed and elective, and graduation follows upon the satisfactory completion of the various courses, military drill, and physical training. Besides the ordinary courses in English literature, languages, and the several sciences, the following purely agricultural studies are pursued in the College: Agricultural Chemistry, Agricultural Botany, Entomology, Physiology of Domestic Animals, Agronomy, Horticulture, Animal Husbandry, Dairy Industry, Rural Engineering and Architecture, The Farm Home, Rural Economy and Sociology, Rural Art, Meteorology and Climatology, and Nature Study.

At Cornell the home as well as the land is studied. The problems of the home fall into two sections: (*a*) The Internal, or Householding Branch; and (*b*) the External, or Communal Branch, where the home is considered in its relation to the church and school. This work has been raised to the rank of university grade, and is based upon a good preparation in the fundamental Arts and Sciences. The subject of Home Economics is taught by women specialists. Moreover, as the farm is a part of the community, so the farmer is a part of society, and the subject of Rural Economics is daily becoming more important. Furthermore, it has devolved upon the Agricultural College to revise the rural school. At Cornell the normal work consists in the two-year special course in Nature study for teachers. Besides the Degree Courses, comprising undergraduate and graduate studies, there are (*a*) Special Courses for students who cannot attend the College for four or more years, and (*b*) Short Winter Courses of eleven weeks in: General Agriculture, Dairy Industry, Poultry Husbandry, Horticulture and Home Economics.

* * * *

The second great Department is that of Extension work, which strives to reach the farmer on his own farm. This is done by means of lectures, institutes and travelling schools. Naturally, such a scheme demands much of the time and energy of both teachers and experimenters, and, in some cases, tends to seriously impair the instruction given to the ordinary student. But, as Professor Bailey truly remarks, a College of Agriculture cannot withdraw from the people and still be able to serve them. It is now a recognised part of the curriculum of a modern Agricultural College to conduct demonstrations and variety experiments upon farms and gardens. At Cornell the work is truly co-operative, that is to say, the farmer provides the labour and reaps the crop, while the expert supervises the experiment. More than 500 farmers are now enrolled in these tests, which are conducted in forty-five counties. Then another aid is the Reading Course or Travelling Library, which was designed to help the farmer in selecting suitable books upon farming topics, and also to make him familiar with the publications of the College. Thirty bulletins have been specially prepared for the Farmers' Course and twenty for the Women's Course.

Plate 26.

The New Buildings of the New York State College of Agriculture.

Cornell University, U.S.A.

Plate 27.

Students Making Cheese.

New York State College of Agriculture, Cornell University.

These bulletins are kept in stock in order to start new readers who may wish to join the circle. It is amazing to note the large number of readers amongst the farmers' wives—20,237—as compared with 6,593 amongst the farmers themselves.

Next, the Extension Work in Nature Study is most comprehensive, and falls under three heads: (1) Gardens—with 28,168 children; (2) Junior Naturalist Work—with 25,111 children; and (3) Instruction by Correspondence for Teachers—with 849 adults.

Further, the Extension Department of the College is associated with the State Grange, an Agricultural Society which has a membership of 70,000 farmers. This Grange provides six scholarships in the College of Agriculture. And both College and Grange take an active part in promoting the Annual Fairs of the State and County. Again, students are constantly sent throughout the State to organise Societies, Reading Clubs, and to hold agricultural meetings. They are the advance agents of the College, preaching the gospel of Agriculture. As Professor Bailey wisely observes: "New York State is the proper laboratory for the College of Agriculture." The result of this wide embracing activity is best seen in the Correspondence Branch, which receives and answers over 60,000 letters each year.

But, in this rapid review, we must not forget to mention the publications of Cornell, which are considered by competent authorities to be the best in the United States. Cornell was the first College to stand boldly out for the principle that nothing was too good for the farmer, and, consequently, her bulletins and leaflets are model publications—being beautifully printed, fully illustrated, clear and concise. And it may be of some interest to state that the publications of our own Department of Agriculture have been mainly modelled on those of Cornell. The following are the publications of the Extension Department: Junior Naturalist Monthly, Quarterly Home Nature Study Course, Monthly Bulletins of the Farmers' Wives' Reading Course, and, lastly, Bulletins publishing data of the various tests and demonstrations.

* * * *

Now, the third great Department at this College is that which comprises Research. In the year 1887, President Cleveland approved of the Hatch Act, which established an Experiment Station in every State in the Union, and, at the same time, appropriated $15,000 for that purpose; and on March 16th, 1906, President Roosevelt passed the Adams Bill. Thus, at no distant date, the fund accruing to the New York State College of Agriculture from the Federal Government for scientific experiments will amount to $27,000 per annum, which is to be set sacredly aside for scientific research. It should be clearly understood that the making of simple "tests" and "trials," and the publication of popular information does not constitute research: these efforts belong to the Extension Department.

So, in future, the work of the Experiment Station will be devoted solely to investigation. As Professor Bailey truly says: "An

Experiment Station is not only directly valuable of itself, but it is essential to a modern College of Agriculture. The discovery of knowledge affords the example and provides for the impetus that all teaching needs. Research cannot be dissociated from the teaching of a College and University grade. Of necessity every teacher in a College of Agriculture who keeps alive is an investigator; this investigation should be organised and the results published. The student catches the spirit of it and develops a scientific habit of mind, taking nothing on authority, but everything on evidence."

Cornell is never still. Her latest educational venture is the Travelling Summer School of Agriculture—the first of its kind in America—consisting of a train made up of a number of students under the care of the Professor of Agronomy. The object of this enterprise is to study agricultural practices foreign to New York State. This particular train will leave Ithaca next June or July, and travel to Colorado, Texas, Louisiana, Mississippi, and the Atlantic Coast States. Special attention will be given to such subjects as ranching, stock feeding, irrigation, rice, sugar cane, cotton and tobacco. The tour will occupy about eight weeks, and a University credit of six hours towards graduation will be given for the course. The Summer School train is not the "Gospel Train" of the Western States which we have already mentioned in the "Journal," but is to be used simply for the instruction of regular or special students in the College of Agriculture.

From this imperfect sketch it will be seen that the central thought which underlies all effort in the College of Agriculture of the University of Cornell is service to the farmers of the State. But the remarkable success of the College has been due, in no mean measure, to the influence of the Director, Professor L. H. Bailey, whose magnetic personality has drawn students from all parts of the world, and farmers from every State in the Union. And, had we time, it would be instructive to pass in review the life of this tireless American from the time he left the Michigan farm till the day he was elected to the Chair of Horticulture, and, later, called to re-organise the College of Agriculture. But it may be said in simple truth that he has left a glowing impress upon every phase of his varied, brilliant, and full career as agriculturist, author, scientist, editor, and educationalist.

To-day, he is justly regarded by his fellow countrymen as the first authority on modern Agriculture, and by his enthusiastic students as the most inspiring teacher in America. And if the lad fresh from the alkaline fields of the arid West holds the name of Hilgard in high esteem, the youth of the Empire State will yield to none in his tribute to Bailey of Cornell.

* * * *

In closing we venture to dwell for a moment upon the great problem of University Education in South Africa.

Professor Huxley, in his memorable rectorial address on Universities—Actual and Ideal—delivered on the 27th of February,

1874, at Aberdeen, made a deliberate statement: "It may be doubted whether universities are the places for technical schools of engineering or applied chemistry or agriculture." The brilliant biologist represented the highest culture of his age. But, to-day, the dullest freshman would know better than to make such a witless remark. Surely a startling change in the conception of the ideal university in the short space of thirty-eight years!

The true university should aspire to teach any person—man or woman—anything; and, further, it must meet the homely, practical wants of every citizen. That is to say, if you wish to build your own cottage, drive an engine or delve for gold, learn to plow or cast type, bake bread or tuck a blouse, or trace the racing lights and shadows of South African history, you should be able to find sound instruction in all these subjects in the several faculties of your University. And mark well. This is no mere fanciful sketch—for you will find all these courses and many more in the great new Universities of America. It is just this daily commingling of scores of students in those various self-governing schools—all under one University Crown—that turns out the finished product of the highest culture, the worker, the thinker and the scholar. For us in the Transvaal, standing at the threshold of a new educational era, and resolved to secure for our sons the richest learning, there looms up the insistent question: What shall be our model upon which to establish our University system?

Shall we follow the lines of the ancient University of Edinburgh—the *Alma Mater* of so many distinguished South Africans—or Birmingham breaking through crusted tradition and creating faculties of brewing and of commerce; or Paris, venerable, and proud parent of all the Universities of France which have arisen to the north of the Loire; of the splendid schools of Central Europe, and the illustrious Colleges of Oxford and Cambridge; or Liverpool, so rich in these dauntless students, daring fever-swamps for the trophies of science; or London, re-constructed, and at last awakening to her Imperial destiny; or Berlin, maker of modern Germany; or Leyden, raised to commemorate those gallant burghers in their immortal struggle with the power of Spain; or, lastly, shall we model our young institution upon one or other of the Universities of the New World.

* * * *

In this paper we have tried to show how the farmers in Minnesota were the means of saving their State University from disruption; and further, how the loyal support of the ruralists of New York consolidated Cornell and made the Agricultural College at Ithaca the foremost institution of its kind in America. And, frankly, our main purpose has been to focus the thought of our own farmers upon the ripe problem of agricultural education and research. It is plain that the farmers of the Transvaal will have a large say in the future educational policy of this Colony. Shall they, like their American brethren, plead for Union or press for secession? In other

words, will they demand separate, independent, and free Colleges of Agriculture, of Mines, of Arts and Science, and of Law: or rather federate all to form one University system? A single University for the whole of South Africa! Is such a scheme too bold a venture for which we have no guiding precedent? The Universities of America have amalgamated counties, and cities, and Colleges—but never States. Shall we go a step forward?

And, after all, what is a campus? Webster defines it as: "*The grounds of a College between the buildings.*" In America it may consist of ten acres or a thousand. For us, why should it not comprise the whole of South Africa, from Simons Bay to Zumba and beyond? But, for the moment, the odds are all against this ideal. The whole tendency of modern University evolution has been toward the single, separate, University for the city or the State. Consider the State of New York. Here you will find Columbia, the University of New York, and Cornell; tour to the middle west and visit Illinois where you will find the new University of Chicago and the old State University at Urbana; pass to California, where you can inspect the State University at Berkeley and the famous University of Leland Stanford at Palo Alto—the richest College in America. Cross to England and there reflect upon the sad internal jealousies which broke up the affiliated University Colleges of Old Victoria, and, in their stead, created the three new City Universities of Liverpool, Manchester, and Leeds. All these must make us pause.

Moreover, the advocates of the single independent University for the city or State will rightly tell us that competition has helped each College. Thus Cornell has influenced Columbia, Chicago has revived Illinois, and Leland Stanford has reformed California. And, further, the secessionists may justly point to the advantage of one common campus, whether it be in a rising populous centre, or, perchance, upon a lonely sunlit plain. But does not the existence of the separate, independent College point to local pride, and, sometimes, we fear, even to foolish prejudice rather than to national sentiment. Why should not the wealthy citizen be content to say to the educational council of his State: "Here is a portion of my fortune, take it and found, wherever you see fit, a new school, a new college, or a new hall, bearing my name, under your common University system, in harmony with your *Continental Campus Plan.*" And, finally. Does not the benefit of a splendid Union outweigh the advantage of purely local concentration? Are we strong enough to set aside all precedent, put our counters in the common pool, and unite all the separate Colleges of South Africa into one University system, even as the brave little Principality linked her three independent Colleges of Bangor, Cardiff, and Aberyswyth into the single University of Wales.

To such a question the final answer will rest with the people of the Transvaal and the Sister Colonies. But, if ever we should seek a fresh Charter under the Crown we may well remember that fine old motto, "Union is Strength," a fitting superscription for the new University of United South Africa.

THE MAKING OF FULL-CREAM GOUDA CHEESE ON A DUTCH FARM.

By Robert Pape, Government Expert in Dairying.

AS I have been asked how to set about cheese-making in this country, it may interest the readers of the "Journal" to hear how cheese-making is still carried on in Holland on several farms. I do not mean to say this method is the most up-to-date, yet I know some of the best Gouda cheese Holland produces is made in this way.

The milk is set for curdling immediately after milking. Some farmers transport the milk from the field to the farm in a rowing boat. It used to be the custom to have the cheese tub in the boat, pour the freshly-drawn milk into the tub and add the rennet—so that the milk was actually curdling during transport. This practice, however, is less common nowadays.

For rennet an extract is used which is offered for sale by several rennet makers, and this extract does very well. The usual temperature for renneting is about 86°-90° Fahr. or 30°-32° Centigrade. To 20 gallons of milk, 10 drachms of rennet extract, 16 grains of liquid colouring material and 5 drachms of saltpetre are added. This should produce a proper curd in about 30 minutes.

The great point about cutting the curd is to fix the exact moment for starting this operation. The dry flat hand is pressed gently on top of the coagulated milk, and when this does not adhere any longer to the hand when gently withdrawn, the moment for cutting has arrived. A further test is to insert one finger vertically into the curdy mass and move the finger gently forward; the breaking curd should then show a perfectly smooth fracture, and some clear transparent serum becomes visible.

The cutting is done with American curd knives, these quite superseding the old-fashioned implements. The operation lasts half an hour or thereabouts. In the beginning the cutting is slow and gentle, and is increased gradually both in rapidity and strength. This seemingly simple process is the most difficult part of cheese-making, and the quality of the cheese is affected materially by it. All attempts to give an *exact* description of the cutting, to serve as a strict guide for cheese-makers, have failed hitherto. An experienced cheese-maker will base the treatment of the curds on the observations he makes during the cutting. Nothing definite can be said about the size of the particles of the curd after cutting. I have seen them the size of peas, but I have seen them very much smaller indeed; both yielding a good cheese in the end.

After cutting, the cheese tub is covered (to prevent the loss of heat), the curd is allowed about five minutes to settle, and part of the whey is then drawn off. Then the mass is carefully stirred up and, during this stirring, hot water is poured in for the cooking of the curd. In this way the temperature is raised from 95°-100.4° Fahr.; ten minutes is allowed for re-setting, after which all the whey is drawn off. Every cheese vat is immersed in hot water or hot whey before it is brought into contact with the fresh curd. Large lumps of curd are put in the vats, broken up by hand (kneading), and pressed into shape again by means of the hands. The vats are left in the cheese tub a few moments for draining, and then the cheese is "turned," *e.g.*, taken out of the vat and re-placed, this time upside down.

Next a clean, dry cheese cloth is put round the cheese. The cheese is then re-vatted and put under the cheese press.

Under the press the cheese is "turned" a few times, and each time should be wrapped in a clean dry cloth, but the majority of makers simply wring the cloth before putting it round the cheese again.

The pressure—slight in the beginning—is gradually increased till a maximum of about 8 lbs. for 1 lb. of fresh cheese is reached. The process takes about 12 hours. After pressure the cheese is taken from the vat, the cloth is removed, the "rim" cut off and then put back into the vat, upside down. After some time the flat surface of the cheese begins to change to a rounded one and the cheese is left in the vat till both sides are equally round. Then it is left to float for 36 hours in a brine of 16° Beaume, to be transferred after this to a stronger brine of 22°-24° Beaume* for 3½ days. In the brine the cheese is turned every day.

Next the cheese is put on shelves in the brining room in order to drip and dry somewhat before it is brought to the cheese-curing room proper. There it is placed on shelves, turned every day, and rubbed with a dry cloth. After three or four weeks the cheese is "watered," *e.g.*, placed in a tub containing pure cold water, left a couple of hours, and rubbed with a cloth. The "watering" is done in order to remove the superfluous salt in the crust. The "maturing" of the Gouda cheese takes from 5 to 8 weeks, after which the mould (if any) is scraped off and the cheese brought to the market for sale.

By means of this simple process the Dutch farmers' wives and daughters have, for many generations, produced an article which found its way to the markets of the world. Could not the wives and daughters of the Transvaal farmer produce a good cheese by a process based somewhat on the above lines? Experiments would soon teach the exact quantities and temperatures required, and the outlay for implements is comparatively small.

*An instrument for determining the density or specific gravity of brine.—(AUTHOR.)

USEFUL FACTS AND FIGURES FOR FARMERS.

TESTS FOR SOUR SOILS.

A simple and fairly reliable method of determining whether a soil is sour is to test it with blue litmus paper. This can be bought at a chemist's shop. Get several samples of moist soil from different parts of the field, mix them into a paste with water, and insert one end of the litmus. At the end of an hour, if the blue paper has turned red where it came in contact with the paste, probably the soil is sour.

The litmus test will usually show with considerable accuracy whether a soil is badly in need of lime, but soils which are not actually sour may need it. The best way is to apply lime to a strip of soil and compare the growth of crops on this strip with their growth on unlimed parts of the field.

HOW TO SWEETEN SOUR SOILS.

A sour soil should be limed at the rate of 1,000 to 4,000 lbs. per acre; two tons per acre is about the maximum of application. The lime should be applied broadcast in late fall or early spring. The best form of lime to use is the water-slaked. Put stone lime in heaps on the ground and cover it with moist soil. In a few days the lime will be found powdered and may then be spread. If air-slaked lime is used, the applications should be heavier. If lime is used in seeding to grass, apply it ten to fourteen days before seeding if possible. It is not usually necessary to lime soils oftener than once in four or five years.—("Soils"—S. W. Fletcher.)

REMEDY FOR CALF SCOUR.

The Maryland Experiment Station, after testing formalin for calf scour, announces that it has found 1 part of formalin in 4,000 parts of milk will almost invariably destroy the organisms existing in the bowels of the calf which are responsible for scour. Dissolve ½ oz. of formalin in 15½ ozs. of water, and add a teaspoonful of this liquid to each lb. of milk fed to the calf.—("Queensland Agricultural Journal.")

TO ASCERTAIN THE AGE OF EGGS.

There is a simple method of ascertaining the age of eggs, based upon the fact that the air space at the broad end of the egg increases with its age, says an exchange. Now, when the egg is placed in a tumbler of water in which any amount of common salt is dissolved,

it will, with increasing age, tend even more to assume a position with its longitudinal axis in a perpendicular direction. A fresh laid egg will lie horizontally on the bottom of the vessel. An egg from three to five days old will rise with its broad end, so that its longitudinal axis is at an angle of twenty degrees. At the age of eight days the angle increases to 45°, at the age of two weeks to about 75°. When the egg is more than a month old it will float perpendicularly on its small end.—(" The Nor'-West Farmer.")

A REMEDY FOR SCALY LEG.

The best plan is to thoroughly scrub the legs and feet with warm, soapy water, using a stiff brush. After drying with a cloth apply a liberal dressing of kerosene. Repeat at intervals. If a practice is pursued of examining the birds, say, once a fortnight, and rubbing the legs with a kerosene rag, this trouble may be banished.—(" The Journal of Agriculture of South Australia.")

A CHAMPION EAR OF MAIZE.

This ear of maize was awarded a grand championship in the United States, and sold for £30. The ear was 10¼ in. long, 7⅞ in. in circumference at a point 3 inches from the butt, 6⅞ at a point 2 inches from the tip, had 20 rows and 1,093 kernels. The weight was 19 ounces. The kernels were 19-31 in. deep, 5-16 in. in width, and 3-16 in. thick. This ear of corn was generally conceded by the best judges and all present to be of outstanding excellence.—(" Breeders' Gazette.")

PRESERVING EGGS IN LIME WATER.

Eggs will keep for twelve months in properly-prepared lime water. The lime water is prepared by slacking 1 lb. of freshly burnt quicklime with a small quantity of water ; the milk of lime so formed is stirred into 5 gallons (50 lbs.) of water. After the mixture has been kept well stirred for a few hours it is allowed to settle. The supernatant liquid, which is now saturated lime water, is drawn off and poured over the eggs previously placed in a crock or water-tight barrel. As exposure to the air tends to precipitate the lime (as carbonate), and thus weaken the solution ; the vessel containing the eggs should be kept well covered. The air may be excluded by a covering of sweet oil or by sacking, upon which a paste of lime is spread. If, after a time, there is any noticeable precipitation of the lime, the lime water should be drawn or siphoned off and replaced with a further quantity newly prepared. The eggs should be completely immersed throughout the whole period of preservation. Although not necessary to the preservation of eggs in a sound condition, a

temperature of 40° Fahr. to 50° Fahr, will, no doubt, materially assist towards retaining a good flavour, or rather in arresting that "stale" flavour so characteristic of packed eggs.—("Queensland Agricultural Journal.")

QUICK METHOD OF MAKING DEVONSHIRE CREAM.

Instead of the preliminary setting up of the milk in pans for twelve or twenty-four hours, as the case may be, in order to allow the cream to rise, the milk is passed through a separator. The separator is regulated to take off thick cream, and this cream is then run gently on to the surface of some separated milk contained in tinned or enamelled iron pans. Scalding is then carried out in the usual manner, not less than half an hour being occupied by the heating process. The pans are then rapidly cooled, and the cream obtained in a thick clotted condition. Where there is a separator this is a very good way to make clotted cream, especially in summer, when it may always be obtained sweet. In hot weather, if the milk has to stand for several hours for the cream to rise, there is a danger of souring taking place.—("The New Zealand Farmer, Stock and Station Journal.")

EXTRACTS FROM EXCHANGES.

METHOD OF DRYING HAY IN SWEDEN.

(*The Journal of the Board of Agriculture.*)

The following is a useful method employed for drying hay in central and northern Sweden, where the season is apt to be very wet at the time of hay harvest. A number of light poles, some 9 ft. or 10 ft. long, are prepared, with pointed ends. When the crop is cut, the poles are driven into the ground in the field in lines of four or five, a yard or so apart. They are placed in convenient places, and the two ends are strengthened by a cross support (see Fig. 1). Tarred cord is then stretched crosswise between the poles in three or four lines (Fig. 1), and the long grass or vetch is then thrown over the cords. It is thus, in rainy seasons, kept off the ground, and, as the wind constantly blows through it, it dries rapidly after a shower, and a few hours' sunshine will suffice to bring it to a proper condition for carrying. The poles and cords are then moved elsewhere as required. By this system, in wet summers, practically 90 per cent. of the hay is saved, and the initial expense of cutting the poles (which last many seasons), and of providing the cord is well repaid. This method is universally used in Sweden.

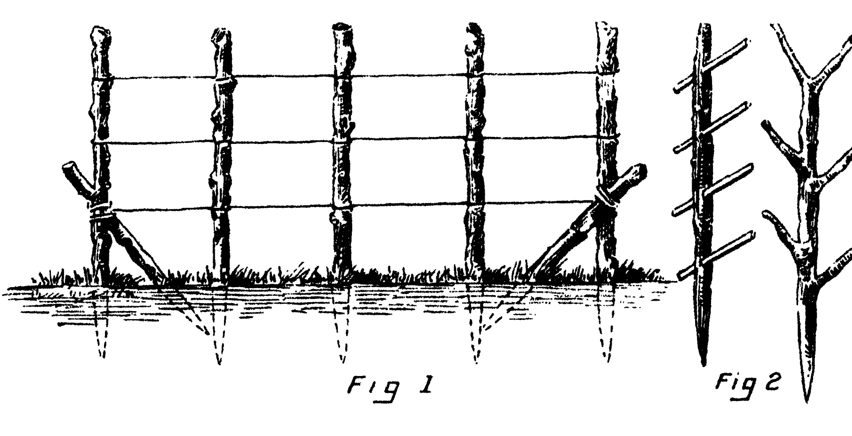

Fig 1 Fig 2

Further north the poles are prepared with cross-pieces inserted, or have short branches left on them (see Fig. 2), and light bars of wood are laid across the supports instead of the tarred cord. It is remarkable how few of these groups of poles suffice to hold up to the air the whole of a heavy crop.

In Sweden wood is, of course, extremely plentiful, and is found on every large estate, so that the initial cost is comparatively small. It would be especially practicable in all districts where spruce and fir are abundant.

WHAT WEIGHT SHOULD A HORSE CARRY?

(Queensland Agricultural Journal.)

We are often inclined to pity a small pony carrying a heavy man on his back, apparently quite disproportioned to the powers of the animal. But it is not always the biggest horse that has the most carrying and staying power. During the Egyptian War, Colonel Drury Lowe, in his march to seize Cairo, was obliged to discard the big British troop horses and mount his big men on the small Arab ponies, which proved quite equal to the work. Amongst human beings a great, tall, gaunt man will often succumb under a load which a little nuggety-built man will make light of. So it is with horses. A thick-set pony, with a bit of breeding, will carry weight and wear down a brute twice his weight that lacks quality ; and a high-bred weed will, even when poor, often work to death a horse of substance. Nevertheless, other things being equal, size, of course, indicates strength, and, having this in view, an English Army Veterinary Surgeon, Major-General Smith, some time ago made exhaustive inquiries into the question, "What weight should a horse be asked to carry?" The method adopted was to ask an independent observer to estimate the horse's carrying capacity, test that in practice, and then weigh the horse ; in this way the proportion which the estimated weight-carrying capacity bore to the body weight was ascertained. Veterinary Surgeon Major-General Smith's system was applied to two groups of horses belonging to light and heavy cavalry, and the result was, as we might expect, broadly speaking, the heavier the horse the more it could carry. The bridge on which the horses were weighed was not sensitive within 28 lbs. It was found that 13 horses whose carrying capacity had been estimated at an average of 170 lbs. weighed each 952 lbs. ; that 10 whose carrying capacity had been put at an average of 175 lbs. weighed each 980 lbs. ; that 10 whose carrying power had been put at 178 lbs. (average) weighed each 1,036 lbs. Further calculations and allowances were made to determine the relationship of a body-weight to carrying power, in a military sense —*i.e.*, performing hard and continuous work—and it was found that, roughly speaking, 5¾ lbs. of body-weight were required to carry 1 lb. on the back during severe exertion.

VETERINARY SCIENCE.

(The North-West Farmer.)

There appears to be a decided awakening in Great Britain and European countries as to the importance of veterinary science. There is, Professor Berry says, an important movement everywhere visible for raising the standard of veterinary education. In illustration of this he mentions that the Imperial Government has granted to the

Dublin College £30,000, which is to be supplemented by an additional grant of £15,000. The Dick College at Edinburgh has been taken over by the Edinburgh Council, and is being heavily financed from the public rates, and has received private bequests amounting to £15,000 ; the University of Liverpool has taken over an institute previously in Edinburgh, and is being largely assisted by municipal rates ; and in London not less than £6,000 per annum is being spent on the veterinary college. That the standard of veterinary education is being considerably raised is shown, he says, by the significant fact that two such differently-constituted universities as Edinburgh and Liverpool are about to establish university degrees in veterinary science. Professor Berry says our aim in the Colonies should be not the reproduction of veterinary science of twenty years ago, but we should rather aim at what veterinary science was about to become in Great Britain.

FARMERS' TELEPHONES.

(*The New Zealand Farmer, Stock and Station Journal.*)

In several States in America there are as many as 30,000 farmers connected with the telephone at a cost of from £2 10s. to £4 a year. Thus the telephone removes their isolation and links them right up with everyday life. It brings them in direct and swift touch with medical aid in cases of sickness, and provided protection by bringing them into touch with the police ; it also is a great saving of time, and time is money to the producer as well as to anybody else. Consider the value of being in constant touch with the markets without having to leave the farm ; to the producer this privilege in four States in America is said to be worth to those who possess it no less a sum than £12,000,000 per annum.

JOLTING MILK DURING TRANSIT.

(*Queensland Agricultural Journal.*)

Another new discovery has lately been reported. In one particular factory it was repeatedly noticed that the milk supplied by farmers from a distance yielded less butter in proportion than that which had only to be brought a short distance. This led to experiments on the effect produced by the jolting to which the milk is liable during transport. The method adopted was as follows : A quantity of milk was taken and divided into three parts, from which butter was made after cooling, followed by ten hours' creaming. The three parts (A, B, C) were, however, subjected to different treatment ; A was at once cooled by means of ice-water ; B after standing two hours ; C after being placed in a tin can and driven about for two hours in

an ordinary cart. The average results were as follows : Taking the yield of A in butter as 100 per cent., B produced 93.2 per cent., and C 88.5 per cent. These figures show that it is by no means a matter of indifference whether the milk is at once cooled or whether it gets a prolonged shaking. The shaking seems to diminish the yield, causing great uncertainty and irregularity in the results. Finally, keep good cows, feed them well, give them plenty of food and shelter, treat them kindly, and observe scrupulous cleanliness, and prosperity is assured.

COLD STORAGE TEMPERATURE.

(*The New Zealand Farmer, Stock and Station Journal.*)

In the evidence of the Dairy and Cold Storage Commissioner before the House of Commons Committee on Agriculture there appear figures on cold storage temperatures which should be of interest to produce dealers and shippers. The safe storage temperatures for different commodities are :—

Apples (long storage), 31-34 degrees.
Apples (short storage), 40-45 degrees.
Butter (long storage), 10 degrees.
Butter (short storage), 20-25 degrees.
Cheese (cool cured), 60 degrees.
Cheese (ordinary cured), 35-40 degrees.
Eggs, 40-45 degrees.
Potatoes, 36 degrees.

PREPARATION OF WOOL FOR MARKET.

(*The Journal of the Board of Agriculture.*)

The Home Wool Buyers' Association have issued the following suggestions to wool growers on the preparation of wools for the market :—

Washing.—Sheep to be carefully washed and clipped within 10 or 12 days after washing, other wise the wool cannot fairly be sold as washed. Sheep should be properly dagged before washing, as the manure not only discolours the water but damages the fleece.

Clipped when Dry.—Sheep to be thoroughly dry before being clipped, as wool clipped in a damp state quickly deteriorates in appearance and value.

Clipping Yard.—The yard or shed where clipping takes place to be kept as clean as possible. Every care should be used to keep the wool free from grass, straw or vegetable matter.

Winding Wool.—The fleece to be neatly wound (no string or twine should be used). All daggings to be taken off. Locks and broken wool to be packed separately.

Dip.—No dip which discolours the wool should be used.

Branding.—The sheep to be branded in such a manner that little of the marking remains when fleece is clipped. All parts affected by tar and composition have to be clipped off before the wool can be used, these being of little value. The Association recommends all sheep to be marked with a mixture that is soluble in hot water, and whenever possible on the head.

Storing.—It is very important that wool should be stored in a dry place, and kept as clean as possible. No grain should be near the wool as it is often carried into the pile by vermin.

Weighing.—No reliance can be placed on the weights of wool weighed in bulk at the railway stations. The Association recommends that wool should be weighed in some more reliable manner. The railway companies only weigh for traffic purposes and do not guarantee correct weight between buyer and seller.

DIARY FOR FARM, GARDEN AND ORCHARD.

NOTES ON THE FARM.

By Alex. Holm, F.H.A.S.
(General Manager, Experimental Farm, Potchefstroom).

February.

Frequent and heavy rainfall characterises the normal weather conditions of this month.

Crops and Cultivations.—Only in exceptional cases are seeding and planting operations performed during this month. For ordinary summer crops the period is too late, and it is too early for sowing ordinary winter irrigated crops. In Middle and Low Veld districts, and in well-sheltered situations, potatoes for winter and spring use may be planted early in the month. Early and medium early varieties only should be planted at this season in localities where frosts take place. The best of such varieties are Early Rose, Epicure, May Queen, Sharpe's Express, British Queen and Sutton's Flourball.

Barley, to be cut for green fodder early in winter, should be sown this month, but as it is often destroyed by "Aphides," it may be regarded as a risky crop.

Grasses and winter pasture plants for green feed during the winter months may be sown up to the middle of the month if the weather is favourable, *i.e.*, showery. If possible, they should be sown with the January rains, and, in any case, it is not considered advisable to sow them after the middle of February. A firm seed bed, with a loose fine surface tilth 2 inches deep, should be prepared, and, in all cases, the seed should be harrowed in with a light harrow immediately after sowing. On loose, or sandy soils, rolling after brairding, preferably with a ring roller, is recommended with a view to giving the plants root hold. Before sowing, an application of 200 lbs. per acre of superphosphate, dissolved bones, guano, or bone flour is recommended.

It may here be observed that the experiments of the Government Agrostologist and Botanist have demonstrated that certain grasses and plants and mixtures thereof can be successfully grown on dry land for winter feed for small stock, but it is advisable to sow them on good land and land which naturally conserves moisture, water-logged soils should be avoided. Since, during the months from July to September, when this feed is required, comparatively little growth takes place, it is necessary to sow considerable areas in order to provide sufficient feed for the sheep or other small stock.

For purposes of providing winter feed for sheep and young stock, the writer is of the belief that certain winter varieties of oats, wheat and rye can also be successfully grown on many of the soils in the

High Veld of the Eastern Transvaal. The success of the winter oat crop has already been demonstrated on some such farms, and, upon application, the writer will supply seed of varieties recommended for this purpose. This seed should be sown from the middle of February to the middle of March, so that the crop may become well established with the late summer and autumn showers. The crop can be grazed during the months of July and August, and, since the varieties indicated possess great powers of tillering and of second growth, they may be expected, with normal spring rains, to produce a fair crop of forage or grain in December.

Irrigated land which has borne a crop harvested in November or December, and which is to be re-sown in the following season, should be ploughed up if this has not already been done in January. This will stop the growth of summer weeds and grasses, will expose the land to the ameliorating influences of the atmosphere, will cause a better tilth to be obtained when the land is cross-ploughed before sowing, and a heavier crop will be grown.

Weeds grow apace during this month, and special attention should be given to horse-hoeing and hand-hoeing of the different crops. It is wiser to grow only as large an area of crops as can be properly managed with the staff of employees available than to grow an extensive area which is neglected and in which the crop struggles for its existence side by side with weeds.

Live Stock.—Diseases of stock, *e.g.*, horse sickness, blue tongue, parasitic worms, are the dread of the stock-breeder during this month in particular, and the wetter it is the greater are the losses. The researches of Dr. Theiler have produced preventive measures of inoculation in mules and in sheep for combating the two former, and farmers and stock-breeders are advised to apply to the Government Veterinary Surgeon located in their district for assistance and advice in this connection.

Parasitic worms, such as "wire" and "thread" worms in sheep, which are responsible for great mortality among sheep, especially lambs, are mostly spread from stagnant surface pools of water in which the sheep drink. As far as practicable, they should be fenced or drained off. Treatment of these worm diseases consist in administering copper sulphate (blue stone), or Stockholm tar. The former is attended with some risk, but the writer has experience of the latter treatment proving entirely successful. Give one tablespoonful of Stockholm tar to each sheep—empty into the mouth with a tablespoon, and repeat two or three times at intervals of a week to ten days in the worst cases.

In well managed pig herds, the second litters will be dropped this month. The young pigs then born will be old enough and strong enough to withstand the cold of the winter months, and, therefore, continue in a thrifty growing condition.

The advantages of allowing stock of all kinds to run in encampments instead of being confined in dirty wet kraals during the night

will be particularly apparent during the wet weather, since they will be more comfortable, will rest better, and, therefore, thrive better on the open veld. The stock-breeder can make no better investment than to fence in a part of his holding in the most sheltered situation for this purpose, even if he has insufficient capital to fence the whole of his farm.

MARCH.

Crops and Cultivation.—Ploughing for the winter cereal crops under irrigation should be pushed ahead. Land which is ploughed before the autumnal rains have ceased can be brought into better tilth for the sowing of crops, moisture will be conserved in the soil, and less irrigation will be required during the winter and spring. Late varieties of wheat, oats and rye, *i.e.*, varieties which take a long time in coming to maturity should, if possible, be mown this month. As a general rule, varieties of crops which require a considerable time to fully develop yield heavier crops than early varieties. Barley which is intended to be cut for green fodder in July or August should be mown this month. In order to grow it successfully for this purpose it must be sown on rich or well-manured land.

No hard and fast rule can be laid down regarding the quantity of seed which should be sown on a given area. The quantity will vary according to the character of the soil, the cultivations, the variety sown, and whether drilled or broadcasted. As a general rule, the more fertile the soil and the better the tilth and the after cultivations, the less seed will be required. Again, warm soils, such as sandy and loamy soils, would require less seed than the colder clayey land.

Varieties which tiller greatly, *i.e.*, which send out shoots from the parent plant, should be sown less thickly than those which do not possess this habit of growth. In drilling, less seed is required than in broadcasting. When sown in the latter manner a proportion of the seed is very often either buried too deeply or is insufficiently covered. The seeding of these crops will vary as follows :—

	Per acre.
Wheat	50 to 100 lbs.
Oats	80 to 120 lbs.
Rye	75 to 120 lbs.
Barley	80 to 120 lbs.

The unevenness in the character of the growth of cereal crops in this Colony is very marked, and is very largely brought about through want of thoroughness in the cultivation, imperfect seeding, and haphazard irrigation. It has been said that up-to-date harvesting machinery cannot be used on account of this unevenness which makes itself particularly evident in the ripening of the crop. The machinery, however, is not at fault, but the grower himself. Farmers should

strive to grow full crops over the whole area sown. Then, and then only, will they be able to compete successfully against the cheap producer.

Haymaking will, in some cases, commence this month, and, after the second week, fairly good weather may be expected for the purpose. Notes on this work appear under April.

Some silage crops will be ready for cutting and ensiling this month. An article on this subject in the July, 1906, number of this "Journal" gives full particulars on this subject.

Live Stock.—Little remains to be added to the notes of previous months. For a winter supply of milk the cows should begin to calve this month. Calves born at this season also thrive well. They will be practically weaned before milk becomes scarce and valuable, and with a little feeding during the remainder of the winter months, they will be strong enough and old enough to thrive on the veld during the following summer.

APRIL.

Crops and Cultivations.—On cropping farms, especially where irrigation is pursued, this month is a busy one.

The seeding of the winter forage and grain crops will be in full swing, haymaking and ensilage should be completed, and a beginning will be made in the harvesting of the mealie crop.

Winter cereal crops under irrigation should, as far as possible, be sown this month. A braird obtained with the usual autumnal showers is advantageous, and, if the crop becomes well established before the dry winter sets in, less irrigation will be required to bring it to maturity. If practicable, the land should be ploughed in the opposite direction to that in which the water flows in irrigation. The seed bed for winter crops should be carefully prepared with the use of harrows and cultivator. Leave the surface with a loose tilth, not too fine, in order to prevent the soil packing and consolidating on the surface after being irrigated. The use of labour-saving implements, such as reapers and binders, will be greatly facilitated if an even seed bed is prepared.

The prevalence of smut and bunt in the grain crops grown in this country frequently involves serious loss, especially in the wheat crop. A practical method of prevention consists in mixing the grain with a solution of copper sulphate. One pound of this dissolved in 1 gallon of water is sufficient for 1 sack or muid of grain. If it be obtained in the ground form it can be dissolved in cold water. It should be sprinkled over the mass of grain in the proportion stated, and the whole should be turned over two or three times. About six hours afterwards it will be fit for sowing. Other excellent methods of prevention can be used, and the formalin treatment described by the Mycologist in the January, 1906, number of this "Journal" is recommended.

Haymaking.—Grass is too frequently cut for hay when it is too old or has been frosted, both resulting in a deterioration of its feeding qualities. It should be cut when still green, and before the seed has ripened. Haymaking is a simple operation in this climate on account of the abundance of sunshine and the infrequency of rain. As a rule, the grass should be raked together the following day after mowing, and on the next day it should be fit for stacking. If, however, the crop is heavy, the rows of hay which have been raked together may require turning over with a fork. The main object to be secured in haymaking is to get the moisture in the grass evaporated as quickly as possible while its greenness is still preserved. For home consumption it is advisable to store the hay in stacks instead of baling it direct from the field. Hay matures in the stack and improves in palatability by being slightly "sweated." The practice of moistening hay in bales or otherwise cannot be too strongly condemned. Mouldy hay is the result, and is often found in the interior of bales of hay offered for sale.

A rectangular stack 10 yards long by 5 yards wide, carried up to 9 or 10 feet at the eaves and then "topped" with a sloping roof will be found a convenient size, and will hold about 20 tons of hay. About 15 lbs. of salt per waggon load and sprinkled over the stack is recommended, especially in cases where the hay is not of the best quality.

The making of silage from maize and sorghum should be completed this month.

Manna will, in most cases, be ready for harvesting. "Boer" and other varieties make good fodder, but care should be taken to cut the crop before it is too ripe and to have it thoroughly dried before storing.

Teff grass, which is now so largely grown for making hay, will, in all probability, be ready for mowing early in the month. Special attention is drawn to the fact that this grass should be cut as soon as the ears or heads come into bloom. The seed ripens very quickly, and while the grass is still green, and if the crop be not cut until this stage is reached, the hay will not be of the best quality.

Live Stock.—With the change of the season particular attention should be paid to the health of the stock. Chills may be expected, and if care be taken to treat the symptoms as soon as they appear, frequent losses from pneumonia and other inflammatory diseases may be prevented. Calves born in spring should now be weaned, and, if the grass is not good, give them some extra feeding to prevent them from losing condition and to keep them growing. The castration of the bull calves should be completed early this month before frosts set in. "Spare not the knife" is a good axiom in breeding. Too many males are left to procreate their species. Many a cross-bred animal may be individually a good beast, but a cross-bred male should not be used for service. Let the male, which stamps the character of the herd, be pure bred.

In districts where lambs are desired in September and October, the rams should be placed with the ewes during this month. The gestation period of a ewe is 20 to 21 weeks. Care should be taken to have thé ewes in good improving condition, if possible, when the rams are placed with them. A better "crop" of lambs will be secured, and, in certain breeds, the percentage of twins will be greater.

April is a suitable month for dipping; too great importance cannot be attached to proper and systematic dipping for the eradication of scab. The common practice of hand-dressing affected animals is most unsatisfactory, and is not attended with the same good results as dipping. In districts where water is scarce, sheep farmers should endeavour to make arrangements for the storage of a supply of water on their own farms, so that dipping might be carried out more effectually, and with better facilities.

In some districts lameness with intense pain is often caused among sheep by ticks, which generally burrow into the tissues immediately above the hoof, though sometimes they attach themselves further up the leg. Lame sheep of the flock should be examined for this daily, and the ticks should be carefully removed. If the part be inflamed or "festering," apply a little tar, or wash with Jeyes' Fluid or other disinfectant.

THE GARDEN.

By Alex. H. Stirrat, R.H.S. (Lond.), Superintendent of Parks, Johannesburg.

In the following monthly notes it is impossible to give full cultured details respecting the cultivation of all the varieties enumerated, the primary object being to direct attention to the work to be done, and which should be prepared for during the months under review, and to give reminders to amateurs and others interested in the general work of the garden.

February.

February and the two succeeding months may be regarded as the autumn of the Transvaal. Most spring sown flowers and vegetables will be nearing their best, and preparations may now be made for supplying the winter requirements and the early spring with strong and hardy plants for bedding out at that time.

Vegetables.—The following varieties of vegetables may be sown during this month:—Lettuce, brown beans, Brussels sprouts, cress, cabbage, mustard, leek, carrots, cauliflowers, celery, parsnips, peas, radish, beat.

Any young cabbage, cauliflower, celery, leek and Brussels sprouts which were sown during the previous months, and are now strong enough, may be transplanted into their permanent positions, but not

until the ground has been thoroughly prepared by manuring, trenching, etc. It is a common practice for the inexperienced performer to insert the young plants too loosely in the ground, and, as the saying is, "hanging them," with the undesirable result that the young rootlets never take a hold of the earth and the young plants ultimately die. These plants, when being transplanted, should be well rammed at the root by the dibble to ensure the plants growing immediately after planting.

Such vegetables as cabbage, cauliflower, etc., should be earthed up as soon as they become established. From experience I have noticed that the growth of these is more rapid when this is done, and the moisture is husbanded to a greater degree. Occasional hoeing is of material assistance to all vegetable crops, and must be attended to in order to obtain the best results.

Flowers.—Chrysanthemums will now be a showing flower. These should be properly staked, and, if large blooms are required, it will be necessary to disbud freely, leaving the crown bud for specimen purposes; those growing in tins or pots should be topped dressed with a composition of well rotted manure and loam, together with a small quantity of bone meal. This composition, when applied to the tins, should be gently rammed, in order to prevent it from being washed over the edge of the tins when watering. In a subsequent note I intend to furnish a list of the best varieties suitable for our climate, and those which have been found most profitable in the Transvaal.

The flower borders will now be at their best, but preparation should be made for augmenting the supply of flowers during the winter months.

The young plants of wallflower, ten-week, or Brompton stock will soon be ready for planting into the positions in which they are intended to flower, and if these are planted in well-prepared ground and in a sheltered position, they should give a creditable display during the dreary days of winter.

During this month most of the varieties of trees and shrubs may be sown. Small nursery beds should be prepared, and, in this connection, I have found it a very wise method to have gum or other poles run along either side of the bed, and at a height of about 9 in. from the ground; straw mats or bags can be run along this during stormy weather and afford shelter during the cold nights which we may experience at any time, and when once these seedlings have a check in this manner, they rarely recover afterwards.

Any budding of roses requiring to be done should be immediately taken in hand before the season advances any further.

In the glass house or conservatory, special attention should be given to the young cineraria, primula, and other similar plants intended to supply early spring flowers. With regard to the former, a strict watch should be maintained for any green fly, and whenever

any are visible the plants should be occasionally dipped in a solution of soapy water or the plants fumigated if the conditions are favourable for such.

Attention might be directed to the fungus found to be attacking many of the pelargonium leaves in some parts of the country, and this disease, if not arrested, may ultimately create considerable havoc with our plants. During the early part of 1902 I find the English authority, Mr. Geo. Massee, reporting on the "geranium leaf rust" as follows :—

"The fungus on pelargonium leaves is the African species of 'geranium leaf rust,' Puccinia granularis, K. and C. Diseased plants should be isolated, and the diseased leaves removed as quickly as the health of the plant will allow. Spraying with Condy's Fluid would prevent healthy plants from becoming infected. The fungus is not uncommon on wild species of pelargonium in South Africa, and has probably passed from such wild plants to the cultivated ones. The fungus is a very interesting species not previously known as attacking cultivated plants. Care will have to be taken that it is not imported into Europe."

It is to be hoped that the foregoing measures will be instituted and thus be instrumental in mitigating the dissemination of the disease.

MARCH.

Hoeing, weeding and watering may take a portion of valuable time, but it is important for a garden and its cultivation. Where such operations cannot be executed at the right time, and in a methodical manner, mulching for special kinds of flowers and vegetables may be instrumental in reducing the water bill ; attacking the self-sown weeds as soon as they appear will reduce the cost of cleaning.

Young cabbage and other members of the Brassica tribe may now be planted out, and, if sown during the former month, will now be large enough for transplanting. Thin out all crops as soon as they can be handled. If any have come up too thickly, it may be well to cut with a knife those not wanted, so that when pulling out the thinnings, the roots of those which are to remain are not disturbed. It is wise that these should have timely attention—rather go over them twice than that they should suffer. Parsley may be thinned out where ready, the thinnings may be planted out into good rich soil to supply the demands in winter. All superfluous growths may be removed from tomato plants, and thereby allow the crop to swell out. It is well, at least once a year, to look over all borders divided by small paths to see that they are being kept to their proper widths. A neat, strong stick put securely in the ground at each corner, is a good help to keep lines straight. When advocating order and arrangement in the strictest sense, we look upon time lavished on the vegetable borders by merely tampering with the surface of the soil simply to give "dress" in a kitchen garden, as worse than time lost. It is

mischief to make soil fine and smooth like dust among growing crops. I would object to a weed more than a clod at any time, and stones, where not over large, are a decided advantage in most soils.

In the flower garden special attention should be given to all young plants intended for bedding out next month, as no doubt success lies in having robust plants when transplanting into their permanent positions. All roses which were bedded during the two previous months should be well looked after, and the bud, which will now be beginning to show signs of growth, should be well staked, otherwise the young succulent growths may be easily broken and the plants permanently destroyed. Remove all suckers immediately they appear. All young trees may now be transplanted from the seed beds into rows as soon as they are large enough to handle. Be careful to shade with mats or branches all young seedlings until they are strong enough; such covering may be thrown over the gum poles previously described in the notes for the previous month. The hoe should be actively utilised in the flower borders, and all weeds kept from seeding.

April.

Small sowing of the following vegetables may be made any time during this month:—Cabbage, cauliflower, onion, parsley, leek, mustard, endive, turnip, radish, carrot, lettuce, etc.

Asparagus beds should be top-dressed with well rotted manure. Thin out and transplant, for successive crops, such plants as cabbage, cauliflower and lettuce. I have found the following cabbage to be the best for sowing during the present month: Wheeler's Imperial and Enfield Market, which should be finally planted in rows 2 feet apart; see that the rows are running in such a manner that they can be easily watered by irrigation, that is, where such a course is permissible.

All superfluous shoots should be taken from tomato plants in order to hasten the ripening of the fruit. Parsley should be well watered with liquid manure, as I know no other vegetable which is more appreciated than a sprig of parsley during any period of the year, and, with judicious planting, a small quantity would be obtainable during any portion of the year. Where the ground and situation is very cold it might be wise to afford some light protection in the way of covering, such as old glass frames, sacking or branches thrown over the plants at sunset and again removed in the early morning.

Although the operations of this month are not the most severe, many details to be carried out are of paramount importance. Everything taken in hand should be done well seeing that the winter is approaching, and any apparent defects should be remedied before it is found to be too late, because the supplies of the garden during the winter will depend greatly upon the good or bad management which is manifested at this period of the year. All the autumn sowings should not only be attended to, but great care taken of them if a regular growth is to be obtained. One great difficulty is the probability

of the ground becoming too dry ; the best means of preventing this, without over-watering the seeds, would be to have the ground thoroughly soaked before the seed is sown, and then covered with bundles, mats, etc., until the seeds begin to germinate.

In the flower garden the floral display is perhaps greater now than at any other period of the year, and, although we may be complimenting ourselves on having the grass and weeds well under control, yet there remains much to be done if high-keeping is desired, and a flower garden not under high-keeping is certainly not a very pleasure-giving object. The picking of decaying flowers, dying leaves, irregular growths, and keeping edges clear of the plants, are just a few of the miscellaneous things requiring attention.

The propagation of plants for next season's supply will demand a lot of attention now, and no time should be wasted in getting a good supply of cuttings inserted, care always being exercised that only those varieties worthy of retaining are propagated, and, in this connection it is advisable to mark with an indelible label such varieties as are worthy of perpetuating.

Roses in tins or pots may have their drainage made right, the inert soil removed, and a good surface given. Chrysanthemums may now be liberally treated by frequent applications of diluted manure water ; those in borders to be provided with stakes, and the plants protected from the destroying winds so prevalent at this period of the year.

I find penstemons one of the most acceptable border plants we have, and should be largely propagated now, and their being hardy adds materially to their value. All seed pods should be kept picked off except in cases where it is intended to propagate from seed.

Carnations, pinks and picotus that were layered should now be well rooted, and may now be severed from the parent plants, care being taken that the young rootlets are not damaged during the operations.

Pot on cineraries, primulas, browallias, etc., before they become pot-bound. Allowing them to become pot-bound, or the soil to become stagnant or sour, gives the plants a check from which they rarely recover.

All greenhouse shrubs should be got well ripened (to stand the winter) as circumstances will allow. Judicious watering, soil and drainage, freeing from worms and careful watering are the predominating requirements at the present time.

Cyclamen should not be lost sight of ; careful watering and plenty of air are the essential needs in order to obtain the best plants. I hope in a future note to specify more minutely the particular requirements of the cyclamen, and why it should be more extensively grown in this country.

Though insects may probably not cause so much trouble at this season of the year, the plants should be well supervised and protected from the attacks of scale, mealy-bug, and thrip. Frequent examinations should be made.

THE ORCHARD.

By R. A. Davis, Horticulturist.

February.

The principal work in the orchard this month should consist in harvesting the crop of peaches, plums, nectarines, etc., and too much attention cannot be given to the selection of the fruit for market. All injured specimens should be rejected, and care should be taken to see that no fruit injured by insect pests, such as beetles, fruit flies, etc., is included amongst that which is intended for sale. No profit can be possibly attached to such fruit. The question of neat and attractive packages is one which should receive due attention. Much improvement has taken place during the last two or three years in this particular, but it cannot be too frequently or too urgently stated that there is still lots of room for improvement in this direction. Our Cape friends continue to send us large quantities of all kinds of soft fruit, and it usually arrives in good order, thanks to the careful packing it undergoes. They set us such an example in this matter that we cannot afford to overlook, with careless methods our markets would be useless to them ; as it is, the Rand is looked upon as the best market in South Africa.

Budding may be done this month on most kinds of deciduous trees. Buds put in now should be fully ripe, plump looking and matured, not taken off tips of growing twigs, but rather towards the base of the growths. After placing the bud see that it is securely fastened in by tying with raffia, which is best for this purpose. No growth is needed until spring, the bud should remain dormant until August or September next.

Summer pruning may also be done on young trees. This consists in thinning out new growths which are not needed, topping long stragglers to a reasonable height, and generally trimming off anything which is not in accordance with a symmetrical head to the tree. Orchard lands should also be looked after with a view to keeping down weeds which grow in the Transvaal to perfection. Frequent use of the cultivator or harrow should be sufficient for this.

Citrus.—Young orange and lemon trees may still be planted up to the middle of the month, but only in such cases as have been compulsorily left over from last month. The end of January is quite late enough to plant these. Budding may also be done, and the same precautions should be taken as mentioned with regard to other trees. Apart from these two items there is little to do in the orange grove, excepting to keep an ever watchful eye for all kinds of scale insects, and when these are found go for them at once. The longer you delay the stronger hold they get, and the more work they provide you with.

* * * *

March.

Deciduous.—A few late peaches are still to be found, principally blood peaches as they are termed on account of their red flesh ; these

are of value because they are late, and should, if nicely packed, fetch good prices. The only other fruit on the trees are apples and pears, and it is good to note that these are more in evidence than previously. A good number of these trees have been planted, and are proving profitable, especially the late varieties. It is out of the question for the ordinary grower to attempt cold storage of this fruit at present. Possibly, as the Co-operative Societies advance, storage facilities may be found in some centres ; meanwhile it may be suggested that the apple keeps exceedingly well if stratified in sand which is quite dry. The best way to do this is to place a layer of sand in the bottom of a box with a layer of apples packed on it, not touching each other, and the process repeated until the box is full, sand, apples and so on. It is an old fashioned custom, but has been found to work well in the Transvaal.

Citrus.—There is not much to be done in the orange grove this month in the way of actual necessary work, but attention is always needed in the matter of root rot, and growers cannot be too careful about this important matter. It is the only really serious trouble we have to contend with, and too much care cannot be taken to keep one's trees free from it. At the risk of repetition, which after all is sometimes of real benefit, the rule must be again laid down that irrigation water must not be led up to the trunks of the trees—no basins must be made for water to flow into in the old fashioned way. Almost any kind of wood, dead or alive, will rot if it remains in water long enough, and the roots of the orange are especially susceptible to disease if treated in this manner. Therefore, rather lead the water in furrows between the rows where the feeding roots are to be found, and when you give water do the thing liberally, and soak the land thoroughly. As soon afterwards as possible cultivate the ground and keep it clean. One good irrigation of this kind does more good than half-a-dozen little driblets applied frequently. In the former case, the water sinks in deeply, and the roots go down into the land to seek it. In the latter insufficient water is applied to do more than wet the surface, and possibly the top few inches, so the roots tend upwards in search of moisture—quite the wrong place for them. Then, if a period of drought comes along, no impossible thing, the leaves begin to turn yellow, and the tree becomes sickly and occasionally dies. Again, do not make the mistake of irrigating too frequently. More orange trees die from getting too much water in the Transvaal than from any other cause.

April.

Deciduous.—This is one of the slackest months in the year in the deciduous orchard. The fruit has been gathered, and it is not yet time for pruning and spraying. One may, however, do a little cleaning up, mend fences and so on, also mark down any unprofitable trees for working over in July or August. Considering also the large numbers of cases where "curl leaf" of the peach was present last season, it may

be as well to remind growers that although this trouble is rather worse in this country than in any other which the writer has yet seen, it is possible largely to minimize its effects if not entirely prevent it.

The preventive measure is spraying in July—or one to three weeks before the blossoms open—with either the Bordeaux or lime sulphur and salt mixtures, and it must be especially borne in mind that for either of these to be really effective good unslaked white lime must be used in the making of them. This is mentioned because poor results were shown in some cases last season after the use of the common grey lime.

The Entomologist is always ready to afford information with regard to these and other sprays.

Citrus.—Early oranges should now be making their appearance on our markets, and the irrigation of those trees which bear them should have ceased ; in fact, with such a rainfall as last year, it should not be necessary in the summer months. In some districts it is possible immature oranges will be dropping from the trees, perhaps in some cases already coloured, and in others still green. It would be as well to cut some of these open and investigate the contents, with the object of finding out whether or not any grub has been at work ; if any should be found the Department would be glad to receive same for examination by the Entomologist.

CORRESPONDENCE.

This column will be devoted to correspondence, and an endeavour made to reply to all inquiries upon agricultural topics, or concerning any of the articles published from time to time in the "Journal."

Correspondents will kindly write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the "Agricultural Journal," Department of Agriculture, Pretoria.

To the Editor of the Agricultural Journal.

Sir,—As a matter which will possibly interest your numerous readers I would like to mention the following facts in connection with some of my fruit trees, especially those which were inclined to be barren.

In one instance I had a vine growing close to a pear tree. The pear tree had no fruit on for two or three seasons; about the fourth season I discovered a good many pears on one particular branch. On closer examination I found a feeler from one of the runners of the vine tightly entwined round this branch of the pear tree. The remaining portion of the tree had practically no fruit on at all. I may state that this particular tree was grafted.

The idea of the tight entwining of the vine on the tree at once appealed to me as a probable remedy for trees which are inclined to be barren, so I adopted it in respect of the other trees on my property by twisting a piece of stout wire round the main stem of the tree with the result that trees which I really intended to root up as no good are now prolific fruit producers.

This appears to me to be of such great interest that I should like to know from you whether any similar instances have been brought to your notice.

Yours, etc.,
DAN STEYN.

Florida.

Answer: I must first of all compliment you on the power of observation which led you to trace the cause of the bearing of one branch of your pear tree, and, secondly, state that this enabled you to discover anew for yourself one of those fundamental principles of nature upon which all scientific fruit culture is based.

The system of "choking the tree" has been in use in the older countries of Europe from time immemorial. It is quite probable that it was adopted owing to the beneficial results to barren trees having been discovered possibly by accident or as a result of observation, as in your own case—whether the principle which governs the system was understood or not is another matter—at all events the results were obtained, and that was the main object.

The natural tendency of most fruit trees in a climate such as ours with a warm and wet summer climate resembling sometimes the atmosphere of a forcing house, is to put on a large wood growth annually; this is caused by the rapid flow of sap induced by the conditions named, and is, in many cases, conducted at the expense of the production of fruit-bearing spurs. Thus, one often sees pear trees up to ten or more years of age which have grown into quite large handsome trees, but which have never had a single fruit on them. The rapid flow of sap has caused the growth of wood, it always has done so, and always will do so—that is one of nature's laws. Conversely, sap which is compelled to travel slowly forms fruit spurs, and does not cause much wood growth: that is another of nature's laws, and any device which can be made use of to check the rapid flow of sap naturally tends to the formation of fruiting wood.

* * * *

It is this principle which is at the bottom of many methods for "making trees bear." For instance, who has not heard of the practice of driving nails into the trunk of a tree or chopping pieces of the bark off with a hatchet or ringing the bark of trees which have not borne fruit? All these little dodges are based on the principle of slowing down the flow of sap. Again, the same thing applies to trees which are trained along walls as in England. The lateral branches convey sap to their tips at a much slower rate of progression than do branches which grow perpendicularly, and this causes the usually extra good fruiting qualities of wall-trained fruit trees.

The system of wiring is one which I have persistently advocated during the past five years in this Colony. It has appealed to me because of its neatness and simplicity; it does not disfigure the tree, and is perhaps more effectual than any other method. One thing, however, must be borne in mind carefully, and that is "remove the wire at the close of the growing season," say, in April; if this is not done the chances are that it will eat through and destroy the bark by corrosion if an ordinary iron wire is used, or, by continued compression, render any flow of sap either upwards or downwards impossible, and the tree will die from lack of nourishment.

I would state, in conclusion, that you will probably find the use of the wire necessary for one year only, as once the fruiting habit is induced it is generally maintained. I do not say that the "wiring or choking" is an infallible method of making all trees bear. There are many kinds of imported peach trees which will never bear in this Colony, largely because they are so far "out of their range" as to be physically unable to bear perfect flowers; many of those they do bear are almost destitute of pollen, and, owing to inherent weakness of organic parts are incapable of fertilisation from outside agencies.

Yours, etc.,

R. A. DAVIS,

Horticulturist.

CASTOR OIL CULTIVATION.

To the Editor of the Agricultural Journal.

Sir,—As many readers ask for information upon castor oil cultivation it may be well to give a few notes on this subject.

A well-drained sandy loam is the most suitable soil for the castor oil plant ; vlei lands are not to be recommended, but otherwise all classes of land on which mealies can be raised may be expected to give good results under castor oil. The land should be well ploughed and harrowed or cultivated to a moderately fine tilth. Foul land is not suited to the crop, as the young plants at first grow slowly and may run considerable risk of being smothered by weeds ; it is therefore advisable to sow only on clean land—old mealie lands which have been well cleaned will probably give satisfactory results.

Sowing.—About 22 lbs. of beans are required to sow an acre 209 by 208 feet. The seed should be sown as early as the rains will permit ; under normal conditions from the beginning to the middle of October will probably be the best time. Plant in rows nine feet apart each way, that is to say, the rows should be nine feet apart, and the hills the same distance in the rows. Four to six seeds should be dropped to each hill, and lightly covered to a depth of about one inch ; if the ground is damp at the time of sowing it is often well to soak the seed for 24 hours in hot water before sowing, in order to hasten germination. When the young plants are from 9 in. to 12 in. high, thin out all except one, the strongest.

Cultivation.—From this time on the crop should require but little attention ; if weeds are troublesome they should be kept down by cultivation between the rows with a horse-hoe or spring-tooth cultivator until the plants are about 2 feet high, when they grow rapidly and can take care of themselves. Where possible, even if the land is clean, an occasional cultivation will probably greatly assist the growth of the crop.

Harvesting.—If left to themselves when fully ripe the pods burst open and the seeds fall out on to the ground, therefore a day or two before the seed heads are fully ripe, that is as soon as the pods turn brown, the spikes should be cut off and carried on a waggon to a drying floor. The drying floor should be an open space with a hard floor receiving the full sunshine, and should have sides from 6 in. to 12 in. high in order to prevent the beans scattering when they burst from the pod.

The seed heads are laid on the drying floor from 2 in. to 4 in. deep, and allowed to dry out and ripen here. The spikes should be turned every day until the seed-pods crack open and the beans fall out ; when this happens the spikes are collected and thrown away, while the beans and broken pods are passed through a winnowing machine until all impurities are sifted out, and the clean beans remain. Care should be taken that during the drying process no water is allowed to fall on the beans, otherwise their quality will be damaged. After the first

harvesting of spikes it will be necessary to go over the field every week or so in order to collect the later spikes as they come to maturity.

When planting a considerable area it is advisable to leave roadways every six or ten rows in order to allow the access of waggons for carting away the spikelets.

For further reference to "Castor Oil Cultivation" see the "Transvaal Agricultural Journal," No. 17, October, 1906.

Yours, etc.,
JOS. BURTT-DAVY,
Agrostologist and Botanist.

WORMS IN OSTRICHES.

To the Editor of the Agricultural Journal.

Sir,—The following reply was sent to Mr. J. E. Erasmus, Randjesfontein, P.O. Pinedene :—I beg to inform you that the worms found in the inside of the ostrich sent here are wire worms (Strongylus Duglassii). The treatment recommended for them is as follows :—

Fast the birds for about eighteen hours and then give the following doses :—

3	months old birds,	2	ozs. of paraffine and	2	ozs.	of milk.
6	,,	4	,,	4		,,
9	,,	6	,,	6		,,
12	,,	8	,,	8		,,
18	,,	10	,,	10		,,
24	,,	12	,,	12		,,

Keep the birds in the kraal for three hours, giving the above dose, then allow them to feed for two or three days ; after which fast them for eighteen hours, and then give the following dose :—

		Carbolic Acid.		Spirits of Turpentine.		Warm Water.	
3	months old birds,	1	drachm	3	drachms	2½	ozs.
6	,,	2	,,	6	,,	5	,,
9	,,	2½	,,	7½	,,	6¼	,,
12	,,	3	,,	9	,,	7½	,,
18	,,	3½	,,	10½	,,	9	,,
24	,,	4	,,	12	,,	10	,,

Keep the birds in the kraal for at least four hours after giving this dose, and at the end of that time it would be a great advantage if, instead of letting them out to graze on the veld, a light feed of grain were given to them ; this would be nourishing, while it would distend the stomach but very little, and allow the medicine to continue its action for three hours more, after which the birds might get a good feed, or be turned on to the veld.

In feeding ostriches which are very much reduced in condition from the presence of these parasites, it is much better to give them small quantities of nourishing food than to allow them, in a fit of generosity, to gorge themselves with a large amount of bulky food.

There is another matter in connection with dosing ostriches for worms, which is deserving of more consideration than it generally receives, viz., the great advantage of obtaining a change of veld. Unless ostrich farmers can make some arrangement for giving their birds a run on clean veld immediately after being dosed for worms, to prevent immediate reinfection, no satisfactory results can be expected from the administration of the most effective remedies, more especially when only one dose is given, which is the general rule.

Anyone who has examined the condition of the stomach and bowels of ostriches which have died from the effects of these worms must have been impressed with the fact that the number of worms was incalculable, and the altered condition of the organs which they infest so great that it would be impossible, by one single dose of medicine, however effective, to expel the worms and restore the organs to their normal healthy condition. And not only should all infected birds receive two courses of medicine, as above directed, in close succession, but unless the farmer can arrange to give his birds a change to clean veld immediately after dosing is finished, he should arrange to dose all his young birds systematically at stated intervals, and not wait until the food is scarce, the condition of the birds greatly reduced and the constitutions weakened.

Yours, etc.,
J. M. CHRISTY,
Asst. Principal Veterinary Surgeon.

PREVENTION OF HORNS GROWING ON CATTLE.

In reply to a correspondent's enquiry regarding the prevention of horns growing on cattle, the Assistant Principal Veterinary Surgeon writes :—" For this purpose pure caustic potash is used. When the calf is about one month old (the earlier it is done the better), the horn buds should be washed with a little hot water and soap, then thoroughly dried : the caustic potash, slightly damped, to be rubbed in over the horn bud and round the base of it, but not actually applied to the skin. If the operation is well done no horns will grow, and the animal will have a nice rounded top to the head just as in the Polled Angus breed.

DEHORNING CALF.

To the Editor of the Agricultural Journal.

Sir,—I have a six months old bull calf which I wish to dehorn. The horns are 1¼ inches long. Can I use frequent applications of caustic potash without cutting the horns?

Athelstead Farm, Yours, etc.,
Wolhuterskop. J. C. P. MAYNARD.

Answer: When horns are grown to the extent mentioned, snipping them off with a pair of shears is preferable to attempting to use caustic potash, which would probably run over the skin and cause nasty sores.

G. E. GRAY,
Principal Veterinary Surgeon.

YELLOW TULP (*Homeria pallida*).

To the Editor of the Agricultural Journal.

A reader writes :—

"I shall be glad if you can give me advice in the following matter : In a paddock of 30 acres of lucerne on my farm on the Vaal there is a large quantity of the yellow blossom variety of the tulp. This plant is, of course, very poisonous to stock when green, but I should like to know if you think it would be dangerous in its dried state if the lucerne is cut for hay. If it is injurious for horses and cattle, perhaps it might be fed to sheep only. What steps should be taken to rid my lucerne lands of this pest?"

Answer: We cannot yet say whether dry tulp will prove poisonous if eaten with lucerne hay, and shall be glad if you can send a couple of bags of the tulp dried in the shade of a shed or other building in order to make a fair test on some stock. To pull all the tulp by hand would, I fear, be too expensive, but this would certainly be the most effective method of treatment, and, if continued for two or three seasons would probably result in practical eradication.

If you are not prepared to adopt such an expensive plan, I would suggest that as the tulp is now ripening off on the Vaal River lands, you should turn a herd of cattle (or, better, a flock of sheep) that are *used to* the tulp into the field and let them graze it off close. They will then break and trample down the tulp so that it will not be present in the next crop of lucerne. If you take animals used to feeding among tulp there will be no danger. But it will be well to provide the herder with two packets of bicarbonate of soda in a bottle of water with instructions to drench tulp-sick cattle, or sheep one packet. Tulp affects horses, cattle and sheep, but animals once used to it rarely, if ever, eat it again even if pressed by starvation.

JOS. BURTT-DAVY,
Agrostologist and Botanist.

THE ENGLISH SPARROW.

To the Editor of the Agricultural Journal.

Sir,—I learn with much regret that the English sparrow has made its appearance in Pretoria. That is the beginning of a veritable curse ; the bird is so destructive, not only from an agricultural point

of view but from an ornithological as well, that its advent is much to be deplored, and every effort should be made to prevent it becoming a citizen. Here, in California, around our cities, in the suburbs, in our orchards and vineyards, it is universal, and has literally driven out our native residents as well as our migrant birds. Only last week I saw a troop of English sparrows attack the nest of a pair of barn swallows, kill one of the birds, and utterly destroy the nest. Just now the United States Government is urging every protection to our insect-eating birds, more especially so since the cotton boll weevil is steadily spreading at the rate of some 50 miles a year. Your people should issue an edict, and from Pretoria to the Bluff at Durban urge an active campaign against this vicious and superfluous intruder. Keep out the English starling also. He is forbidden entrance to this coast. A word to the wise is sufficient.

Yours, etc.,

FREDERICK W. D'EVELYN,

President, Co-operative Ornithological Club.

California.

SISAL HEMP CULTURE.

To the Editor of the Agricultural Journal.

Sir,—By this post I am forwarding a copy of a Queensland journal wherein you will see an article on the cultivation of sisal hemp. I am told that this is an industry quite capable of being made a feature in Transvaal agriculture, and I venture to trespass on your courtesy so far as to ask whether you can give any information on the point, *pro* or *con.* The cultivation of sisal, if feasible here, seems to promise good things for our farmers.

Yours, etc.,

Johannesburg. F. W. SPENCER.

Answer : Sisal hemp and fourcroya gigantea are two very distinct plants, and their fibres are not of the same value ; sisal is the best, and is, indeed, one of the most important of vegetable fibres. We have been growing sisal experimentally at Pretoria and at Tzaneen for some time. The climate of Pretoria proves unsuited to its growth for commercial purposes. At Tzaneen it has been doing remarkably well, and seems a most promising crop for that part of the country.

Unfortunately, however, a fungus disease has broken out on the leaves, which is spreading rapidly both on sisal, fourcroya and the common "American aloe" (*Agave americana*) of our gardens. This bids fair to ruin any immediate prospect of growing sisal or Mauritius hemp commercially in the Transvaal. This disease is being investigated by the Plant Pathologist of this Department.

J. BURTT-DAVY,

Agrostologist and Botanist.

EDITORIAL NOTES.

Transvaal Land and Agricultural Bank.

On the fourth day of last November the long-hoped-for Land Bank was formally opened to the public. It may be well, therefore, to again indicate the purpose of this notable institution and the facilities it affords to our farming population. As it is the purpose and policy of the Transvaal Land and Agricultural Bank to further agriculture and the breeding of stock, it should be clearly understood that any person who desires to obtain money from the Bank for those purposes will naturally have preference over those who only seek to pay off debts or former bonds. There are two kinds of loans, viz.: fixed loans and instalment loans. Fixed loans are only granted for a period not exceeding five years, on which interest is payable half-yearly at 6 per cent. in advance. Instalment loans are granted for periods not exceeding twenty-five years; these instalments are payable half-yearly, and, of course, at the expiration of the term for which the loan is granted, the capital and interest have been paid off. Further, it is desirable to point out to intending applicants that it is of the utmost importance that they should clearly explain, on forms supplied by the Bank, for what purpose the loan is required, and, in all cases, must they mention the names of their creditors. It is also essential that the applicant should fully and categorically answer the questions contained in the application form. Loans not exceeding 60 per cent. of the agricultural and pastoral value will be made upon the security of freehold and quit-rent land, and, not exceeding 50 per cent. of its value, upon the security of land held under the Occupation Law. Except in special cases no advances will be made for amounts less than £50 nor exceeding £2,500. Insurance will not be specially required for the purposes of these loans, as the advances are made upon the basis of the value of the land irrespective of buildings. Loans to co-operative societies which have been approved by the Rt. Hon. the Minister of Agriculture will be made both on a fixed and instalment basis upon the value of raw or manufactured produce for the purposes and upon the conditions set forth in Section 30 of the Land and Agricultural Bank Act No. 26 of 1907. Furthermore, it is intended to formulate regulations by which farmers may be able to get advances on produce not of a readily perishable nature, properly stored and insured. These regulations will have to be laid before Parliament for approval before they can be put into force.

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The Bank at present is unable to assist the farmer who has no fixed property to offer as security, but who is willing to pledge his stock and growing crops, his plant and machinery, as the case may be. Until some system has been evolved to insure both live stock and farm crops,

this kind of proposition cannot be dealt with directly by the Bank. It is hoped, however, to eventually reach this class of farmer through the medium of co-operative societies, of which they should all be members. In this way assistance might be afforded to the industrious farmer who has only his character and his energy to commend him.

During the first month of the Bank's existence 830 applications were received, aggregating in all a sum of about £460,000. Of this amount some £20,000 has been granted outright. Of course a large amount has been granted for smaller sums than originally applied for, and for which the consent of the applicants is still awaited, as well as their assent to their portion being strictly defined, before passing the bonds.

The following directors have been appointed by the Government :

Th. Herold, Esq. (Chairman).
J. A. Dieperink, Esq.
General C. Muller.
J. C. Minnaar, Esq.
John Dougall, Esq.

Mr. L. Naude, formerly Chief Inspector of the Netherlands Bank, was appointed Manager, and Mr. R. R. Richardson, Accountant, late of the Master's Office.

In the Agricultural Notices of this issue will be found a circular relative to the application for loans.

The Potchefstroom Sale of Stock.

THE third annual sale of pure-bred cattle, sheep, pigs, poultry and goats belonging to the Department of Agriculture took place at the Potchefstroom Experimental Farm, on Saturday, November 23rd. During the afternoon of Friday a heavy thundershower set in, and, for a time, it looked as if the discouraging downpour of the previous year was to be repeated. But, with morning came genial sunshine and a perfect day, the harbinger of a record sale both in prices and attendance. The morning was spent by the visitors inspecting the farm, the orchards and the live stock under the guidance of the General Manager, Mr. Alexander Holm. At 11.30 a parade of stock was held, and attended by His Excellency the Governor, the Rt. Hon. the Minister of Agriculture, the Director of Agriculture, many prominent citizens, farmers, and stock-breeders. By noon over 400 people had arrived, many farmers coming from remote districts in the Transvaal. Bidding was brisk and there was a distinct advance in the prices realised by the bulls, notably Shorthorns.

Last year the highest price—61 guineas—was given for an Ayrshire bull ; this year the record was established by a Shorthorn (Coates) bull bred on the farm which went for 93 guineas. It is noteworthy that the three Shorthorn bulls bred on the farm averaged £80 17s. each. A Lincoln red bull, bred on the farm, brought the

Plate 28.

Some Bulls sold at the Potchefstroom Experimental Farm Stock Sale.

high price of 85 guineas, and went to Sir George Farrar's herd at Bedford. The prices of the bulls were good throughout, the lowest figure being 39 guineas. Although these figures are most gratifying as showing the value placed upon pedigree stock in the Transvaal, they also emphasise the need of maintaining a larger number of pure-bred stock upon the Government Experimental Farms in order that the small farmer may have a chance of securing first-class animals at a figure within his limited means.

With regard to rams, the Suffolks bred on the farm were in great demand ; the average price of Suffolk rams bred on the farm was £17 3s. 6d. as compared with £14 14s. 8d. last year, and for Shropshires bred on the farm £16 9s. 2d., as compared with £14 5s. 7d. last year. The Angora rams, which were purchased from the famous flock of Mr. C. G. Lee (Cape Colony), president of the Inter-Colonial Agricultural Union, made the average price of £5 2s. 6d. No less than 80 young pigs, bred on the farm, were offered for sale. The most popular breeds were the large black and the large white Yorkshires. The pigs realised from two guineas to seven guineas, and the prices were practically the same as for pigs of similar ages at last year's sale. The total sum realised at the sale was £1,865 15s.

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His Excellency on Agriculture and Education.

At luncheon, in acknowledging the toast of the Governor of the Transvaal, His Excellency made a stirring and optimistic speech which was listened to with the closest attention. Lord Selborne, who never loses the chance of showing his sympathy for the farming community, has a firm belief in the future of Transvaal agriculture as was made clear by the significant remark: "There is nothing the American farmer can do that you cannot do if you choose. It is just the same in regard to the Australian farmer. There is nothing the Australian farmer can do with his wool that you cannot do, and what we have all got to work for is that there shall be no farmer, either in America or anywhere else, who does better with his land than the Transvaaler."

At the outset the Governor emphasised the need of remembering that the mining and farming industries are dependent upon one another. And that the real prosperity of the mining industry is of importance to every farmer in the Transvaal. Next, passing to agriculture, Lord Selborne observed that he had always maintained that the Transvaal should become an exporting country. In the past he had often instanced wool and tobacco, and now he was glad to be able to add another very important product, namely, mealies. It was a splendid beginning, he remarked, this export of mealies to England. Then he put the question : "Supposing a Commission were appointed to enquire into the number of bags of mealies that the Transvaal farmer secured on the same amount of land," what would be the answer? He was told

on good authority that the American farmer grew as much as 25 bags on an acre, which is half a morgen.* Lastly, His Excellency urged farmers not to take their children away from school too early, and closed with these eloquent words: "I know very often when a farmer is poor and struggling, it is a great temptation to take his children away from school at an early age in order to help him on the farm, but, after all, the business of the farmer is to sacrifice himself for his children, and if you want your children, as you do want them, to be better men than yourselves in every way, then keep them at school —(hear, hear)—for the future of the Transvaal depends on them. It is to the future of agriculture in the Transvaal, coupled with the name of the Premier and the Minister of Agriculture, that I ask you now to drink." (Loud applause.)

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The Premier on Co-operation.

In responding to the toast of "Agriculture," the Rt. Hon. the Premier and Minister of Agriculture delivered a rousing speech, and, at the same time, preached a homely sermon on the gospel of self-help. General Botha remarked that "what was most needed in this country was a greater willingness to pull off one's coat and get to work." With regard to his Department he stated that farmers would be interested to learn that in future only pure-bred stock would be kept upon all the experimental farms. Further, the Government intended offering gold medals as prizes for the young of the stock sold and which were exhibited at shows. This would apply to horses and sheep as well. Although the experimental farms might cost the country a good deal, that expenditure should not be considered in view of the great benefits derived from those stud and experimental farms. (Hear, hear.) He would ask them to take into account the large sums spent by the Government each year in their efforts to exterminate cattle diseases. That would show them that the Government was making great efforts to place the stock-raising industry on a better basis. But it was impossible for his Department to stamp out diseases unless they had the co-operation and cordial support of the people. In some districts which he had visited he had found matters in a deplorable condition, which was only to be attributed to a want of co-operation with the Department, and the result of that was that diseases were not only hampering the raising of stock, but were exterminating the stock. He would ask them once again to come to the assistance of the Department in its efforts to stamp out disease. In some districts the people were on the verge of starvation, but the Government could not lend assistance because they could not send cattle to those particular parts. He referred to the good work done by Dr. Theiler. (Applause.) He had only made the reference to show that where there was co-operation and where the Government was supported there

* The average production of the Transvaal is probably from three to five bags per acre but statistical data is lacking.—(Ed., T.A.J.)

were the greatest successes gained. He held that the future of the stock raising and agricultural industry was great. (Applause.) He had noticed that a gentleman who had given evidence before a Commission the other day had said that the agricultural future was but a dim one, but he (General Botha) maintained that if they clasped hands no future was more brighter than that of agriculture. (Applause.)

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They would never be able to supply the markets beyond their borders if there were not more fraternal co-operation. During the past seven or eight months he had received deputations from co-operative societies almost daily, but he regretted to say that not one co-operative society had said they wished to co-operate without pecuniary assistance from the Government. (Laughter.) Those were things which could easily be carried out. Take their wool for instance. The majority of the farmers sold or exchanged their wool at one or another of the stores. That was a wrong principle. Why should they not hold sales of wool every month which could be attended by the buyers of East London and Port Elizabeth? One society was prepared to arrange such sales, but wished the Government to pay it fivepence while the wool was being brought together for sale. If they wished to co-operate they would not require the fivepence. (Laughter and applause.) Each farmer should be prepared to say: "There is my wool, it can lie idle for a few weeks." (Applause.) Then take mealies. Some farmers sold their mealies at 6s. when not pressed for money, while if they sent their mealies—under the existing arrangement between the Transvaal and Natal—to England, and had waited three weeks they would have got 9s. per sack. The Government desired to help the agricultural community in every respect, but the policy of self-help was the better one after all. (Applause.) He considered that the railway rates should not be more than 10s. per ton to the coast ports. In conclusion, he remarked that the recent campaign against the locusts had proved a great success. The presence of Lord Selborne would serve to encourage them a great deal. He thanked them all heartily for their presence there that day. (Applause.)

The visitors then proceeded to the sale ring.

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The Government Veterinary Bacteriologist.

OUR readers will have learnt with much pleasure that His Majesty the King has conferred upon Dr. Arnold Theiler the most distinguished Order of Companion of St. Michael and St. George (C.M.G.). This Order, which was founded in the year 1818, has as its motto: "Auspicium melioris aevi" (Augury of a better age). Dr. Theiler, who was born in Switzerland in the year 1867, is a native of the Canton of Lucerne, where his family are still engaged in stock farming. Our future Bacteriologist passed into the Cantonal College of Aargan, attended

the Veterinary Colleges of Berne and Zurich, and, at the last College, obtained the State Diploma of Veterinary Surgeon. Later, he gained the degree of Doctor in the Veterinary Faculty of the University of Berne, and, after having duly qualified as a veterinary surgeon to the Swiss Army, he left for South Africa, arriving in the Transvaal in the year 1891.

Dr. Theiler was appointed Director of Lymph Form in Johannesburg in 1893. The following year he was appointed veterinary surgeon to the Sanitary Board and Mine Sanitation Department, a position which he held for two years. In 1896, at the outbreak of rinderpest, he went on a special mission to Rhodesia, and, subsequently, received the post of Government Veterinary Surgeon to the late Government. In 1899 he represented the Transvaal and Natal Governments at the International Congress of Veterinary Surgeons, held at Baden-Baden. He also visited Basutoland on the outbreak of rinderpest there in 1901, and Rhodesia in 1902 in connection with Rhodesian tick-fever. Dr. Theiler was appointed Government Veterinary Bacteriologist in July, 1900. In September, 1905, he attended as a delegate the International Veterinary Congress at Buda-Pesth.

Since the first issue of the *Transvaal Agricultural Journal*, Dr. Theiler has been a constant and valued contributor, and his brilliant researches in the fields of Veterinary Pathology, Bacteriology, and Parasitology have made his name a household word in South Africa and won him European renown.

The Superintendent of Co-operation.

It is with much pleasure that we welcome, in the name of our farmers, the Superintendent of Co-operation, who has recently arrived from Denmark to take up his post in the Department of Agriculture. Mr. B. Stilling-Andersen is specially qualified for the work he is about to undertake, having had considerable business experience in his own country, on the Continent, and in Great Britain. His initial work will be to travel throughout the Colony and make himself acquainted with the needs of the rural community.

Many people will be interested to know that Mr. Stilling-Andersen is the son of the founder of Danish co-operation—that movement which has done so much to promote the permanent prosperity of Denmark, and has proved a model for the whole world. We feel sure that we can assure the Superintendent of Co-operation of the hearty sympathy and support of every farmer in this Colony.

In this issue we publish a paper on co-operation, which will be of special interest to our readers.

In the whole history of agriculture there are few more romantic stories than the rise of this little people, tucked away in a small State of some 15,000 square miles, or, in other words, in a country not so large as the district of Waterberg. A few figures tell the tale in an eloquent manner. A population of 2½ million people keep over a million cows, and export butter alone to the value of over £8,000,000 per annum. What is the reason of this conspicuous success? It is simply co-operation. One of the Danish educational authorities, in speaking of the progress of his countrymen, remarked the other day that it was due to their policy of "moving together." All for each and each for all. "Our advance," he said, "is a movement of the people from the largest proprietor to the smallest crofter." For us in the Transvaal there is a sermon in that sentence.

The Dairy Expert.

All dairy farmers in the Transvaal will be glad to learn that the Government have appointed a Dairy Expert in the Department of Agriculture. Mr. Robert Pape, who has had a distinguished career, was born in Paramaribo, in Dutch West Indies. Being educated in Holland, he finally obtained his diploma at the Openbare Handels School in Amsterdam in 1894. Next entering the service of the "Koninklyke Nederlandsche Maatschappy van Kaas en Roomboter-Fabrieken" as a "volontair," he rapidly rose to the important post of controller. In 1895 Mr. Pape attended a course given by Dr. Mader on the chemistry of milk, and, the following year, entered the famous Dairy School of Rütti in Zollitofen, near Bern. Here he worked for some time in the laboratory of the eminent bacteriologist, Professor Freudenreich. At this institution Mr. Pape paid special attention to the manufacture of Gruyère cheese, and, at the same time, prosecuted original studies respecting the influence of different salts upon the curdling of milk. A little later, Mr. Pape spent the best part of a year in London studying the English market requirements. In 1898-1899 he successfully managed a large dairy in Bolsward, being promoted to the post of Chief of the Dairy Laboratory, and, later, Controller, specially charged with the technical management and administration of the dairy industry. He has also made several important improvements and minor inventions in dairy machinery, and has formulated a new process for treating milk after reception at the dairy which is intended to supersede the Schwartz and the separator systems. This method is now widely used in the dairying centres of Friesland. With the coming of Mr. Pape we see the beginning of a dairying industry in the Transvaal, and we are sure that, at no distant date, our farmers will produce all the butter, milk and cheese required by this Colony.

Dairy Co-operation in Holland.

REGARDING dairy co-operation in Holland, Mr. Pape writes: "In the Hague we find milk production on a very large scale. The city is situated in a centre of a very fertile part of the country where splendid pasturage is found. The middlemen saw a golden harvest before them in controlling the milkshops of the whole city, and, although fair prices were paid for the produce by the public, the farmers themselves realised less and less for their milk. Some enterprising farmers decided that this unsatisfactory state of affairs should be remedied. They succeeded in establishing a co-operative society, 'De Landbouw,' with the avowed purpose of procuring a better price for their milk and so improving their financial position.

"'De Landbouw' is really a limited company with a capital of £8,400; mortgages provide the further required working capital. Shareholders never receive more than 4 per cent. interest, any further profit is divided among the milk suppliers in proportion to the quantity of milk supplied.

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"The 'Landbouw' was established in 1900, and, five years later, the milk price paid to the farmer had increased about 4½d. per 10 gallons. Milk is cheap in Holland, and this increase, though it may seem insignificant when judged by the standards here in the Transvaal, means a good deal to the farmer in Holland. The buying power of money in Holland is nearly three times the buying power of money here, and the yield of a cow comes up to an average of about three gallons daily (= 30 lbs., or 24 to 30 bottles). Calculated on these lines, this would mean over here that each cow brought an extra daily profit of about 10d.

"Every milk supplier to 'De Landbouw' is a shareholder. Therefore all use earnest efforts to put a first-class article upon the market. The newest pattern filters are employed, and all farms use Schmidt's refrigerators. Consequently, all the milk handled is well filtered and well cooled after milking, which improves the quality generally. 'De Landbouw' has four receiving stations: in two of them the surplus milk is turned into butter. The daily supply runs from 3,100 to 3,300 gallons. Most of this is sold as milk, fresh or pasteurised. The society has five retailing shops and a few 'milk-saloons'; fifty-five handcarts and three horse vans deliver the milk at customers' houses. The Dutch farmer has mistrusted co-operation for years, but, finally, he has discovered 'there is money in it,' and co-operative concerns are rising all over the country."

The Export Trade in Mealies.

So much has recently been printed in the daily press with regard to the export of mealies during the past few months that it would be superfluous to trace back the history of this movement. At the same time we should not forget that Natal was the first to put this export trade upon a sound and practical basis, and for this the Government and the farmers of the Garden Colony deserve the heartiest thanks of the whole farming population of South Africa. The despatch of half-a-million muids of mealies from Natal relieved the inland centres, and the Transvaal was saved from the depressing effect of swamping the local mealie market. Colonial competition being thus lessened, the demand for South African mealies will probably increase and prices rise accordingly. But, in any case, it is satisfactory to know that our farmers have before them the prospect of the more or less stable and practically unlimited markets of England and Europe in place of the highly fluctuating Rand.

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We understand that 23s. 6d. per quarter (480 lbs.) is considered a good price for American mealies upon the London market. Towards the end of last October Natal mealies touched 28s. per quarter, and the average prices worked out at a net profit to the consignor of 8s. to 9s. per muid. The export trade is under the auspices of the Natal Government, and an Inspector has been appointed at the port to supervise the grading of the grain. Ten classes have been decided upon as follows: three midland, three coast, three yellow, and one for uniform qualities.

The other day we read: "The fever of speculation has been checked in Natal, and there is an evident desire to cultivate the agricultural industry and the natural resources of the Colony." In the Transvaal we may well take a lesson from our Sister Colony.

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It will be of interest to our farmers to know that the Government of the Transvaal has not been standing still in this matter. And we are glad to be able to announce that, as the result of negotiations between the Transvaal Government, the Central South African Railway Administration and the other South African Governments, an arrangement has been entered into with the Portuguese and the Cape Governments, operating as from the 1st of January, 1908, whereby the maximum rate for the conveyance of mealies for export oversea, by any route—including delivery of mealies to vessels and other usual services—from any station in the Transvaal and Orange River Colony will be 10s. per Colonial ton. Negotiations to the same end are in progress with the Natal Government, and a similarly satisfactory result is anticipated. The Portuguese and the Cape Governments have been cordial in their readiness to assist the inland administrations in bringing about the satisfactory results now notified. A meeting of representatives from the several Colonies interested will be held at

Pretoria to settle the various details such as grading, etc., in connection with the arrangement come to. The Conference Lines having notified a low uniform rate from the several South African ports for mealies to London, Hamburg, and other important European ports, negotiations are now in progress with the Transvaal Agent-General in London for the introduction of through bookings and sales for the benefit of such of the growers as desire to take advantage of same.

While our farmers are arranging for the export of their Transvaal mealies, there are two points which we would like to emphasise. The first is that all mealies to be shipped should be put in sound bags, well sewn, and made quite secure. Each bag sent forward for export should be clearly marked with the exporter's private mark and the Government Inspector's Official Stamp. It is also imperative that every farmer should supply mealies of good quality and proper weight, otherwise our grain will get a bad name on the English market, and all the efforts of the Government to foster this industry will be set at nought. Secondly, a strenuous effort should be made to increase the yield per acre. As we have mentioned before, 3 to 5 bags is the probable average annual yield. But, last year, several yields of 10 or 12 bags per acre were reported; and one farmer with "Yellow Horse-Tooth" got an average of 20 bags per acre. From our own experience in mealie growing, we are convinced that the present average yield could be almost doubled, even without the aid of manure, if only our farmers would put their land into better tilth before planting, and by constant cultivation during the growing season so lessen the loss of much valuable soil moisture in the dry spells.

Mealie Acreage in the Transvaal.

At the annual meeting of the Witwatersrand Agricultural Society the Chairman, Mr. Lionel Phillips, remarked that he had been informed that if they put one-tenth of the land of the Transvaal under cultivation they could get a return of no less than 30,000,000 bags of mealies per annum. This statement was characterised as startling, but that it was perfectly accurate may be seen from the following figures. The Transvaal consists of about 111,200 square miles, or, in other words, 71,000,000 English acres. If we take one-tenth part, or 7,100,000, and multiply by 4 bags per acre we get 28,400,000, or by 8 bags (steam plough cultivation) the figure runs to 56,800,000 bags per annum. It may be said with truth that one-tenth part of the Transvaal will never be placed under mealies. But on a farm of 6,000 acres it would not be a sensational figure to speak of placing 600 acres under a grain crop. The value of such figures mainly lie in arresting the attention of the public to the scope that our country affords the agriculturist. And, in view of the possible development of the export trade in mealies, we do not hesitate to recommend that the Government should seriously consider the question of co-operative steam ploughing. Let us assume that a steam plough could be placed in ten districts. We may set down the

Plate 29.

Steam Cultivation at Vereeniging.

Ploughing old Mealie Lands.

Plate 30.

Steam Cultivation at Vereeniging.

Showing five-furrow steam plough and packer.

following problem: 2,000 acres x 10 ploughs = 20,000 acres; at 8 bags per acre = 160,000 bags per annum.

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Steam Cultivation.

As we often receive enquiries as to the cost of steam cultivation, Mr. W. A. McLaren, the General Manager of Messrs. John Fowler & Co., has kindly furnished us with the following data:—

The amount of land that a steam plough can turn over is from 15 to 20 acres of ordinary good veld per day. The consumption of coal is estimated at three tons of Vereeniging seconds at 7s. 6d. per ton, or one ton of good Natal coal per day. The percentage of breakages is small. A fair estimate of expense for labour, coal renewals, and interest or money invested would be £5 per day or £1,500 per annum. Three white men are usually employed upon each steam tackle which consists of two engines, one five-furrow plough, cultivator, consolidator and a set of six harrows, water cart and sleeping van, costing £4,500 approximately, delivered f.o.r. The white men could probably be hired at £12 per month, and the overseer at £15; five Kaffirs at £2 10s. per month are also required.

Mealies can be produced on new lands at 5s. 3d. per bag; on old lands the cost is still lower. Mr. McLaren lays great stress upon light harrowing after the mealies are planted until they reach 6 in. to 9 in. in height. Let us suppose that a co-operative society or syndicate of farmers wanted to purchase a steam plough. On ordinary good land they could plough practically the whole year round and reckon on doing, say, 2,500 acres. A steam plough should be kept constantly at work. It is a mistake to build a machine-shed for a steam plough as it should be at work in the lands every day in the year. The deep stirring of dry lands by means of the steam tackle seems to be very beneficial in mealie cultivation in the Transvaal.

The Natal Government loans out steam ploughs, and charges 10s. per acre on plain or ordinary veld, and 15s. per acre on the more difficult sugar lands. Next August Mr. McLaren intends to plant a thousand acres of mealies on land that has been prepared the previous season, and hopes to reap an extra early crop. (Plates 29 and 30.)

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On Sugar-Beet Culture and the Manufacture of Beet-Sugar.

SINCE the appearance of certain letters in the local press advocating the establishment of sugar-beet factories in the Transvaal, the Division of Botany has received numerous enquiries on this subject.

Mr. Burtt-Davy writes as follows:—

Our co-operative experiments have demonstrated that sugar-beets can be grown on the High Veld, in the Lydenburg, Wakkerstroom, Standerton, Pretoria and Potchefstroom Districts, giving yields which vary from

7 tons to 17 tons per acre. The sugar-content has been satisfactory, viz., 16.26 per cent. to 17.8 per cent. in mature roots.

The crop has shown some power of drought-resistance, but, in this climate, where spells of drought of 10 to 14 or more days' duration are so frequent, a certain amount of irrigation is necessary to prevent a check in growth. Plants subjected to such a check usually develop poor, badly-shaped roots, and these give a relatively low sugar percentage.

But the fact that we can grow sugar-beets in the Transvaal is no indication that we can grow them profitably, or that the economic conditions will warrant the establishment of beet-sugar factories here.

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The manufacture of beet-sugar cannot be done on a small scale by farmers, as is the case with cane-sugar. A central factory is required, and extensive experience shows that it does not pay to establish a factory of smaller capacity than 300 tons of beets per diem. A small factory like this costs $250,000 (£50,000) in the United States, and might cost more here; the larger California factories cost up to $5,000,000 (£1,000,000). The factory runs for not more than about three months of the year, after which it has to be overhauled and repaired. For eight or nine months, therefore, the plant is idle. The interest on outlay and the reserve fund for depreciation, as well as working expenses and profits must all be earned in the three months of the "campaign" as the working period is called. Usually the beet has to be handled as it matures, and the factories are kept running day and night, weekdays and Sundays alike, to keep pace with the maturing crop.

A large force of trained chemists and of skilled mechanics on good salaries is kept constantly employed during the "campaign," but most of these have to turn their attention to other things during the rest of the year. Where there is not a certain supply of such trained men who can be drawn upon as required, the factory must keep a number on the permanent staff or it finds itself handicapped at the beginning of the campaign.

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The running of a factory is, therefore, a costly operation. In order to cover all expenses in the three or four working months, it is necessary to run the factory to its maximum capacity, and to have a very large area of beets tributary to it; the smallest factory in California has 10,700 acres under crop each year; other factories have over 60,000 acres. The beet crop should be grown in rotation to give good results; even if we practise only a two-year rotation (*i.e.*, sugar-beets every other year) it means that the area tributary to the factory must be doubled, *e.g.*, a small factory will require at least 20,000 acres of suitable land.

To be worked profitably, such area should be as nearly as possible in one large block, so that the crop can be delivered at the factory

expeditiously and at a minimum cost. For the most economical production of uniformly good beets, fairly level fields are of great advantage. To get reasonable profits the most capacious planting, cultivating, and harvesting appliances must be used, and all these are best suited to level or gently sloping lands. Again, it should be borne in mind that only certain soils are suited to this crop ; the best are rich, sandy loams with medium moisture conditions. It would be very difficult at the present time to secure a sufficiently large area of suitable soil in the Transvaal to conform with all these requirements.

Another point to be borne in mind is that the sugar-beet is not an easy crop to grow profitably. Only experienced farmers can grow good beet crops, and even the large American manufacturers import thoroughly trained men from Europe, whose duty it is to constantly travel about among farmers who are growing the beets under contract, in order to watch the crops and warn and advise them in cases of improper treatment or of pending danger to the crop before it is too late to remedy the defect.

During the early growing season cheap labour is required to thin the crop by hand, and this thinning must be done at the proper moment or the crop will suffer. It is, therefore, necessary to have a large and reliable supply of labour at the critical time. Thinning is the hardest and most expensive operation in connection with sugar-beet culture, and upon it the success or failure of the crop largely depends. It must not be delayed beyond a certain stage or the plants may be injured and the roots mis-shapen, resulting in low sugar-content.

Although the price paid for sugar-beets is good, about 16s. 6d. per ton, or £11 per acre, the crop is an expensive one to grow, costing anywhere from £6 to £10 per acre according to local conditions. The net profits to the grower in the United States range between £2 and £6 per acre. It will readily be seen that unless the grower understands how to produce a heavy yield per acre he will get no return for his trouble ; a crop of only seven tons per acre would cost more to grow than it would sell for.

Here are some of the essentials in successful sugar-beet culture :

(1) A good supply of water for irrigation, except where the regular rainfall can be depended upon. In the Western United States four to eight furrow irrigations are required during a season.

(2) An abundant supply of pure water for the extraction and refining of the juice.

(3) For a 300 ton capacity factory, 50 tons of coal daily or its equivalent in wood.

(4) For the same factory, 20 tons of lime rock per diem. The Chief Chemist points out that magnesian limestone (dolomite) would not do for the purpose, but that suitable limestone is available in the Transvaal.

(5) Competent labour at reasonable prices and in sufficient quantity.

(6) Economic methods of handling the pulp either by feeding to stock or preparing for the factory or market.

Finally, Mr. Burtt-Davy regrets that under the present economic conditions prevailing in the Transvaal he cannot see any immediate prospect for the establishment of a sugar-beet industry which would be profitable either to the grower or to the manufacturer.

The primary reasons which have led him to this conclusion may be summarised as follows :—

1. The difficulty and expense of raising a profitable crop of sugar-beets. This is an art rather than a science and can scarcely be learned by reading about it ; it requires practical training.

2. The difficulty of securing sufficiently large tracts of good soil under irrigation and within sufficiently easy reach of any suitable site for a central factory to ensure delivery at low cost and to warrant the minimum necessary outlay for a factory.

Blue Tongue Vaccine.

At this season of the year sheep farmers should prepare to check the ravages of blue tongue in their flocks. Last year, farmers who inoculated in time saved a large percentage of their animals. The following directions for the use of blue tongue vaccine should be carefully noted. This vacc ne may be obtained on application to any Government Veterinary Surgeon, or to the Government Veterinary Bacteriologi ., P.O. Box 593, Pretoria, at a charge of 1d. per dose, ten extra doses being added gratis to every hundred doses ordered. The utmost care is exercised in its preparation, but no guarantee is given, nor will compensation be paid for any deaths or accidents which may follow its use.

Hypodermic syringes for carrying out the inoculations may be obtained from the firms whose names are given on the attached list. Syringes which are provided with a graduating wheel on the plunger bar are recommended as being most convenient for use. With care such syringes will last for several years. The greatest care must be taken to prevent the contamination of the vaccine or the syringe by dust or other foreign matter. Vaccine should be unpacked and kept in a cool place, but must be used within 15 days from date of arrival. When the vaccine is unpacked examine it, and if any bottles shew leakages or have broken corks they should be returned to the Government Veterinary Surgeon or the Government Veterinary Bacteriologist.

Do not inoculate your whole flock immediately the vaccine arrives, but first of all inoculate about twenty of the flock with the smallest bottle of vaccine as soon as possible after the vaccine is received. The operation of vaccinating is very simple, but should be carried out carefully according to the manner laid down herein.

First the syringe should be disinfected ; to do this place some cotton wool or cloth in the bottom of a clean tin basin or pan, and fill this with water ; take the syringe to pieces, unscrewing the metal cap at the top of the glass barrel ; place on top of the cotton wool in the pan together with the needle, and place the pan on the fire. After the water has boiled for about ten minutes take the syringe out and screw it up and fit the needle to it.

Next obtain a clean glass tumbler or cup and wash with boiled water ; then uncork the bottle of vaccine in some place where dust is not likely to enter it, and pour some into a cup, placing a clean piece of paper over the glass so that it extends about half-way down and forms a cap. After pouring out the vaccine re-cork the bottle immediately, and do not return to the bottle any vaccine which has been poured into the cup and which may be left over after inoculating. Once a bottle has been opened all the vaccine should be used.

Syringes may be purchased as under :—

Mr. E. G. Bull, Box 4040, Johannesburg :—

		s.	d.
Prices :	5 cc.	10	0
	10 cc.	12	6
	20 cc.	15	0

Messrs. Lowenstein, Adams & Co., Box 68, Johannesburg :—

		s.	d.
Prices :	5 cc.	14	6
	10 cc.	16	6
	20 cc.	21	0

Messrs. Meyer, Meltzer & Co., Box 6257, Johannesburg :—

		s.	d.
Prices :	5 cc.	14	0
	10 cc.	20	0
	20 cc.	23	6

These prices do not include postage.

Mr. C. E. Gray, Principal Veterinary Surgeon, has prepared a timely leaflet on wire worm which causes serious loss amongst sheep.

Mr. Gray writes :—

Wire Worm. The disease frequently becomes established thoroughly in a flock before its existence is suspected. Infected sheep lose condition gradually, even although the grazing is abundant, and there is no apparent reason for their doing so. They are weak, languid, and easily fatigued, a dropsical swelling appears between the jaws, and if a flock is driven hurriedly, the most severely affected animals may fall down in a faint, from which they may recover after lying a few minutes, or they may die without regaining consciousness. On post-mortem, the first thing which attracts attention, even if a fair amount of fat is present on the carcase, is the extremely watery condition of the blood, which coagulates badly, and is so thin that it does not even stain the fingers. Should this be noticed, the fourth stomach should then be opened, and the contents carefully examined for the parasites, or the wall of the stomach may be scraped, and the scrapings placed in water, and then poured out in a sandy spot, and when the fluid drains off, the worms will be observed moving about in large numbers. The parasites are very minute, being only about half an inch in length, and resemble in appearance a short length of red and white thread.

The treatment recommended by Dr. Hutcheon in his article on the subject is exceedingly effective, and is quoted beneath :—

"In using the bluestone solution for the destruction of the stomach wire worms of sheep and goats, the solution should not be stronger than sixty bottles—nearly ten gallons—of water to one pound of commercially pure bluestone, and that the doses should be correspondingly increased as follows :—

"For lambs 3 to 6 months	.. ..	1½ to 2 ounces.
,, 6 to 9 months	.. ..	3 ,,
,, 9 to 12 months	.. ..	3½ ,,
,, 12 to 18 months	.. ..	4 to 4½ ,,
,, 18 months and over	..	5 ,,

"The experiments clearly indicate that larger doses may be given with safety, but I am anxious not to endanger the use of this remedy which, although it has recently been getting into bad repute, is the only mixture I have seen tried which is effective in killing these stomach Wire Worms at a *single* dose if the stomach is empty and the solution enters it in sufficient volume. Further, there is no mixture which sheep and goats will drink so readily as the bluestone solution."

This leaflet is issued in English and Dutch, and can be obtained free of charge on application to the Government Printer, Box 373, Pretoria.

A Note on Lightning Destruction.

NOT long ago a house was struck by lightning in Johannesburg, and Mr. H. E. Wood, Chief Assistant, Transvaal Meteorological Department, has kindly sent us a report of the damage done. The house struck was double-storied, situated at the corner of Minors Street and Fortescue Road, Yeoville, and occupied by Mr. Newton. On the west side of the house is some vacant ground with ridges of rock outcropping. On the east side are some houses in Fortescue Road which stand higher than the house struck. Mr. Newton's house had the usual galvanised iron roof, but *no precautions had been taken in the way of connecting the roof to earth.* The roof was very steep and pyramidal in shape, coming to a sharp apex. The chimney stack came through the roof some feet away from the apex and did not appear to have been struck at all. Apparently the roof was struck near the apex by a heavy discharge which sub-divided itself and reached the ground by various paths.

Part of the discharge left the roof by the various gutter pipes and then leaped across the short distance between the ends of the pipes and the earth. In the front garden the distance between the end of the pipe and the soil was about 2 feet, and a quantity of soil had been thrown up where the discharge had apparently gone to the ground. In the rear of the house some wire netting had been fixed to the gutter pipe and the netting was partially fused.

The internal damage appears to have been due to a discharge taking place between the roof and the electric light wires over the ceilings of the upper rooms. In this way the discharge spread itself throughout the house and did damage in various rooms. In the kitchen the supply meter was wrecked and the main switch and fuseboard were torn off the wall. There had apparently been a large arc across the fuse terminals after the fuses had been blown, and probably a small explosion. A Cape girl who was in the kitchen at the time was knocked across the room.

In the principal bedroom there were two sets of electric wires suspended at the head of the bed—one carrying a switch for the lights and the other a bell push. Part of the discharge seemed to have come down these wires and brushed off from the ends. The lighting switch was smashed and pieces driven across the room. Mrs. Newton, who was in this room carrying a baby, was thrown on to the bed. She described the appearance as that of a ball of fire in front of her. People in the house across the street saw this room illuminated by the lightning. The baby was wrapped in a blanket which was slightly singed probably by a flying piece of the heated switch. A portion of the discharge left the house by the water supply pipes, and a very curious accident due to this was the splitting of a union joint in the pipe just outside the garden at a distance of thirteen yards from the

house. Blackened earth was thrown up here, and the accident was detected by the escaping water. Since the accident the house has been fitted with a lightning conductor on the apex of the roof, and *the roof has also been earthed at all possible points through the gutter pipes.*

* * * *

Cape and Thibet Barley.

THE Thibet Barley (*Hordium cœleste*) shewn on Plate 32, was grown last winter at the Botanical Experiment Station, Pretoria. The seed was originally obtained in Thibet by Lord Kitchener and sent by him as a present to the Transvaal.

The Cape Barley shewn on the plate was grown alongside. The soil was exceedingly poor, hard and unmanured, which probably accounts for the poor size of the Cape barley. The heavier yield of the Thibet sort seems to indicate that it is better suited to adverse conditions than the Cape variety, but further test is needed to actually prove this point.

The Thibet barley has given good satisfaction to farmers in several parts of the Transvaal. It proves to be a heavy yielder when given a proper chance.

* * * *

Tree Planting.

IT may be well to remind our readers that this is the season for planting out citrus trees, and two points are worth remembering. First, it is much better to spend a few extra shillings and get good clean stocky trees which will be a pleasure to look at in after life, than to buy ugly crooked trees which can never be made straight. Secondly, all trees should be carefully examined for scale insects. There is nothing prettier than a thrifty orange or naartje tree free from sooty mould, scale insects and plant lice. In planting, a hole 3 feet wide by 2 feet deep should be made, and, after the earth has been filled in around the roots, two buckets of water poured gently on. The time for planting deciduous trees is in the month of July or August depending upon the locality.

* * * *

The Agricultural Parcel Post.

IT is with much pleasure that we welcome the latest effort to help the farming community, viz., the newly-established parcel post. The Post Office authorities deserve to be warmly complimented on their enterprise. Hitherto it has often happened that the farmer when sending small consignments to the market has found that his profit was almost entirely absorbed by the middleman; but now he will be able to deal direct with the consumer. The new parcel post charges are certainly very low. To be able to send produce up to 11 lbs. in weight anywhere in the Transvaal for 1s.—with proportionately lower charges for smaller amounts—is

Fig. 1.

Plate 31. Fig. 2.

Cape and Thibet Barley.

Fig. 1--Thibet Barley. Fig. 2--Cape Barley.

Plate 32. Fig. 1. Fig. 2. Fig. 3. Fig. 4.

Cape and Thibet Barley.

Figs. 1 and 2 – Cape. Figs. 3 and 4 Thibet. Beards removed to show size of heads.

a striking concession. It will encourage the consumer to buy eggs, poultry, jams, honey, fruit, or flowers, etc., direct from the farmer, and if the various farming associations can arrange some system by which lists of farmers who wish to take up this trade can be circulated amongst the consumers, some real benefit to the agricultural community should follow. When it is mentioned that the ordinary parcel post charge in the Transvaal is 8d. per lb., and that under the new "agricultural parcel post" 1¼ lbs. can be sent anywhere in the colony for 3d., the large reduction made will be better realised.

Commencing on January 1st parcels containing articles produced, or, if manufactured, produced and manufactured wholly within the Transvaal, will be accepted at all Post Offices in Transvaal for conveyance by post to any place within the Transvaal at the following rates :—

Up to 1¼ lbs.	3d.
Over 1¼ lbs. and not more than 3 lbs...	6d.
Over 3 lbs. and not more than 6 lbs.	8d.
Over 6 lbs. and not more than 9 lbs.	10d.
Over 9 lbs. and not more than 11 lbs...	1s.

If desired they may be registered on payment of an additional fee of 4d. No parcel weighing more than 11 lbs. will be accepted.

The maximum dimensions will be the same as for the inland parcel post, viz. :—Length 3½ ft., length and girth combined 6 ft., and the general regulations of the inland parcel post will apply to the agricultural parcel post. The agricultural parcel post will be for parcels from and to places within the Transvaal only. All parcels (whether containing Transvaal produce or not) for places outside the Transvaal must be prepaid at the ordinary inland parcel post rates.

* * * *

Parcels for conveyance by the agricultural post must not be posted in a letter box, but handed in at the Post Office counter. The sender will be required to sign a declaration that the contents are the *bona fide* produce, or, if manufactured, the produce and manufacture of the Transvaal. The penalty for a false declaration of contents is a fine not exceeding £50, or imprisonment with or without hard labour for a period of six months.

The following articles may, under the conditions stated above, be sent by the agricultural parcel post :—Butter, eggs, poultry, bread, biscuits, yeast, dried meats, jam, honey, tobacco, cigarettes, confectionery, sugar, dried and bottled fruits, flowers, seeds, plants, vegetables, leather (unmanufactured), wool samples.

The service, however, is not restricted, and the new rates will apply to parcels containing any articles produced, and, if manufactured, produced and manufactured, within the Transvaal. Parcels by the agricultural parcel post may contain an invoice, but not a letter or anything in the nature of a letter. They must be packed in such a manner that the contents will not injure any other postal packet.

Poisoning by the Arsenical Locust Spray.

It is gratifying to be able to state that there have been fewer fatal cases of arsenical poisoning this season than last year. The Entomologist has investigated all cases that have been reported, and in nearly every case it has been found that it has been due to carelessness in using the poison. The great tendency is to mix the spray too strong in order to kill the voetgangers at once, whereas a very weak solution is quite sufficient to kill the voetgangers, only requiring a little longer time to do so. We frequently find that farmers do not carefully weigh the arsenite for mixing the spray, merely throwing in several handfuls of arsenite into a bucket of water, thus making the solution much stronger than even the strongest solution recommended.

* * * *

A New Scale.

Last September when the Natal Entomologist was passing through Bloemfontein he discovered a scale insect on certain trees in Bloemfontein which closely resembled the famous San Jose scale (*Aspidiotus perniciosus*). A casual examination of this scale led him to believe that it was actually the San Jose scale. In view of the great amount of damage to fruit trees that this scale has done in the U.S.A., it thought best to call a meeting of entomologists of South Africa to discuss the matter and decide whether special measures must be taken to restrict the spread of this pest. After discussing the matter carefully and examining specimens of San Jose scale from America belonging to the collection of the Cape and Natal entomologists, it was found that this new scale was not the San Jose scale. The scale is the most closely related species to the San Jose scale which has yet been observed, different from it in only one microscopical character. The following are the trees upon which it has been found at Bloemfontein so far :—Peaches, pears, apples, peppers, acacias and mimosas. The scale is destroyed by a parasite, and attacks so few fruit trees, and these to such a slight degree, and spreads so slowly that it is unlikely ever to be a serious pest. The San Jose scale produces eggs (*oviparous*), but this new scale cannot spread so rapidly as it is *viviparous*, viz., producing its young in a living state and not by means of eggs. It probably is a scale indigenous to South Africa, which is just beginning to develop a taste for cultivated trees. A similar species, possibly the same, has been known for some years at the Cape. Credit should be given to the O.R.C. authorities for calling the attention of the other Colonies to this supposed pest so promptly in order that they might protect themselves against its importation. For the present, however, our Plant Import Regulations are sufficient to cover this case and protect us from this new pest.

Ermelo Stud Farm.

At the Government Stud Sheep farm at Ermelo 440 merino sheep have recently been shorn, giving a return of 5,368 lbs., or within a fraction of 12 lbs. of wool per head. Three young Tasmanian rams, 12 months old, bred on the farm, yielded at the first shearing 14½ lbs., 15¾ lbs., and 16 lbs. weight of wool respectively, heavy weights for ram lambs. The remainder of the young farm-bred rams cut an average of 15 lbs. per head, which is satisfactory, as it must be taken into consideration that they are all ages from lambs to four tooths. The two Rambouillet rams clipped 19 lbs. and 21 lbs. respectively, and the Rambouillet ewes averaged a trifle over 13 lbs. per head.

The Standerton Stud Farm Sale.

The first stock sale of the Standerton Stud Farm was held on Saturday, December 16th. This sale was the outcome of the decision of the Rt. Hon. the Minister of Agriculture to keep only pure-bred stock on the stud farm, and was the first sale of its kind held by the Government in the South-Eastern Transvaal. The day was perfect and the sale passed off in a most satisfactory manner. The attendance was good, and over two hundred farmers and stock breeders came from all parts of the Transvaal, along with the Minister of Agriculture, the Director of Agriculture and various departmental officials. At 10.30 a.m. the Manager, Mr. A. McNae, held a parade of stock, and the Government stallions attracted much attention. Bidding was brisk both in the forenoon and the afternoon, and, with few exceptions, the prices were well within the reach of the ordinary farmer, who, in several instances, got good brood mares with foals at a low figure. A detailed list of prices and buyers will be found in the Agricultural Notices of this number.

After luncheon the Minister of Agriculture delivered a short speech. General Botha pointed out the real purpose of their meeting at Standerton, and welcomed the visitors to the first sale at the stud farm. The stud farm had been established with the object of assisting and encouraging the farmers, and the Department of Agriculture was determined to make it a first-class stud farm. (Applause.) It was the intention of the Government to spend a great deal of money in the future on the importation of thoroughbred stock for the farm. He asked purchasers of stock in the Colony to pay greater attention to the class of stock they bought, and to remember that while the best stock cost a great deal of money, the better an animal was bred the better he should be looked after. Government asked the assistance of the public towards making a success of its efforts to advance the stock-breeding of the Colony. He welcomed their co-operative expert, Mr. Andersen, to that gathering, and was also pleased to announce

that the Government's dairy expert, Mr. Pape, had arrived at Pretoria. (Hear, hear.) The Director of Agriculture and himself had just been discussing the question of obtaining assistance for the tobacco expert, and he hoped to be able to tell them that Mr. Smith, during his visit to America, had obtained a couple of additional experts for the tobacco industry of the Transvaal. The Government had succeeded in establishing a tariff to assist and encourage the exportation of mealies, whereby mealies could be conveyed from any Transvaal railway station to the coast at 10s. a ton. The handling of the mealies would be looked after at the coast, and everything done to encourage export. An official at the coast would see that none but good mealies were sent, and the farmer who did not pay the best attention to his produce would receive it back again. (Hear, hear.) Everything in this connection would be done in the cheapest way, and the Agent-General would look after things at the other end. With general assistance on this and the other side of the water they would accomplish something great in their export trade. He concluded by mentioning that in matters of general agriculture and the breeding of stock the Department of Agriculture was prepared to give all information required to farmers, through their experts and veterinary surgeons. (Applause.)

Swaziland Cotton, 1906-7.

THE following notes regarding the Henderson cotton growing experiment at Baligane, Komati Poort, Swaziland, which we received through the courtesy of the Henderson Consolidated Corporation, Limited, may be of interest to our readers :—

Sown from 10th October to 10th November, 1906. Cut worms absolutely cut down 75 per cent. of original seed planted, and only by perseverance in planting was a crop obtained. Soil, rich grey loam—an old alluvial bed of the Komati River. No irrigation—rainfall for season, 35 inches. Flowered 10th January, 1907 ; first bolls opened 8th March, 1907, and 30th April, 1907, plot fully open. Yield of whole plot of each variety :—

Cook's Long Staple	579 lbs.
Truitt's Big Boll	517 „
Bohemian	447 „
Russell's Big Boll	438 „
Abassi	94 „
Trash	175 „

The latter (Trash, *i.e.*, ground cotton) about equally divided among the first four classes. One acre sown to each variety. First picking, 18th March, 1907 ; picking on the plot became general, 30th April, 1907 ; last picking, 31st August, 1907.

The principal fault has been planting too close together in such rich soil, causing an interlocking and matting of the whole crop, rendering picking a matter of extreme difficulty ; secondly, the want

of poisons and how to deal with insect pests at the proper moment; and, thirdly, insufficient cultivation.

The following statement was received by the British Cotton Growing Association from Messrs. Wolstenholme and Holland regarding cotton samples from the Henderson Consolidated Corporation, Ltd. :—

Mark.	Value.	Classification.
Truitt's Big Boll, 1st quality	About 8d.	American character, "About Fully Good Middling" in grade, rather creamy, staple 1" to 1⅛", irregular in length.
Truitt's Big Boll, 2nd quality	7d. to 7⅛d.	Stained, fairly clean about.
Abassi Big Boll, 1st quality	Value to-day about 10d.	Clean, good colour, does not maintain Abassi character, staple 1¼".
Abassi, 1st quality, 2nd sample from later picking	10d. to 10½d.	Not quite equal in grade to 1st quality, but rather better in staple.
Abassi Big Boll, 2nd quality (unsuitable for English spinners)	8½d.	Rather stained and leafy, fair sample.
Cook's Long staple, 1st quality	About 8d.	Clean, good colour, about "Fully Good Middling," staple 1" to $\frac{1}{16}$".
Cook's Long staple, 2nd quality	About 7¼d.	Rather stained, some leaf, staple irregular and rather short.
Bohemian, 1st quality	7d. to 7⅛d.	Clean, good colour, but staple too short for general enquiry.
Bohemian, 2nd quality	About 5½d. to 6d.	Very stained, staple weak and short, unsuitable for demand here.
Russell's Big Boll, 1st quality	About 8d.	Good colour, and clean, but staple irregular and rather weak, about 1" to 1⅛".
Russell's Big Boll, 2nd quality	7¼d.	Stained, staple irregular in length, ⅞" to 1⅛".
Buckham's Cotton ...	10d. to 10½d.	Abassi character, fair colour, staple fairly strong, seed probably Egyptian.
Trash	5d. to 5½d.	Very dirty and leafy, staple irregular.

The Abassi and Truitt's Big Boll seem most suitable for cultivation and produce best results.

* * *

International Tobacco Exhibition.

In view of the interest of the public and the trade in tobacco grown in the several British Colonies, the management of the International Tobacco Exhibition have decided to encourage the display of Colonial leaf tobacco at the exhibition to be held towards the end of March, 1908. This will be the first organised arrangement to show in London, side by side, all the tobaccos grown in the British Empire, and it is hoped that it may lead to tobaccos which at present are comparatively unknown being placed upon the English market. The samples will be submitted to careful examination by a committee of leading London experts competent to judge the respective samples and to suggest any necessary improvements. The judges will be well-known London tobacco brokers and manufacturers.

It is of the utmost importance that the Transvaal exhibit should be representative and of superior quality. With this object in view, the Government Tobacco Expert will carefully examine each sample submitted, in order to avoid the exhibition of inferior samples. Samples should be packed in such material as oilskin or tinfoil, to prevent exposure to the air. Full particulars and description must accompany each sample, and extracts will be printed in the official catalogue. This will enable the exhibition authorities to properly label the samples. The labelling will be done by the exhibition management from the particulars supplied. Price at which the leaf is usually sold is to be stated. Competing samples should weigh about 4 lbs., and must reach Pretoria not later than February 1st, 1908. Samples should be addressed to the Government Tobacco Expert, Department of Agriculture, Pretoria. All expenses in connection with packing and the transport of the samples from Pretoria to London will be borne by the Government. The manager of the exhibition will pay the duty, and the samples will become his property after the exhibition, unless otherwise arranged.

* * * *

Sale of Fruit Trees, Vines, Cuttings, Scions, etc.

It is notified for public information that, in future, payment must be made for goods on or before delivery. When purchasers mention a railway station to which packages may be consigned for them, advantage may be taken of the "Collect on Delivery" system of the C.S.A.R. In all other cases cash should accompany the order, but it is advisable prior to remitting same that enquiries should be made of the Government Horticulturist as to the ability of the Division to supply the trees ordered.

Agricultural Shows and Prizes.

We wish to direct the attention of our readers to the dates of the various shows which will be found under Agricultural Notices, and also to the Government Notice No. 1186 in the same column which gives a list of the prizes offered by the Department of Agriculture at the shows to be held in the Transvaal during the present year.

Ostrich Farming.

Mr. A. York, of Christiana, writes us: With reference to Mr. A. S. Pringle's letter appearing in the October, 1906, number of the "Journal" on "Ostrich Farming" in the western parts of the Transvaal, I may say that great credit is due to Mr. N. Moore, who came up from Willowmore, Cape Colony, to farm in this part with ostriches. He was the first farmer who ventured to bring ostriches here. Mr. Moore being a practical ostrich farmer could see at a glance that ostriches would do here on this veld with the aid of lucerne, and, therefore, he wished to be on the river so as to be able to pump water from the river to grow lucerne. Mr. Moore tells

me that there is no risk in farming here with ostriches, only that we must put in lucerne to feed the chicks and the birds during the winter months. I am putting in lucerne on the dry lands along the Schoonheid, and if I am successful I intend getting some ostriches.

Agricultural Imports and Exports.

Some very interesting figures shewing the value of farm produce imported into the Transvaal during the year ended 30th June, 1907, as compared with the imports during the year ended 30th June, 1906, have been extracted from returns furnished by the South African Customs Statistical Bureau, Capetown. It should be borne in mind that the classification this year is not identical with that for 1905-6, and that, therefore, the figures are only approximate.

Imports.—The following are some of the principal increases: Living animals, £194,811; tobacco, £7,685; rice, £26,430; cheese, £20,049; beans and peas, £5,562; flour and meal (wheaten), £36,402; maize, £31,802; wheat, £4,680; fresh vegetables, £1,870; South African wines and spirits, £38,127. The rather large increase in this last item is doubtless due to the Customs Convention entered into at the beginning of the year; a corresponding decrease in connection with wines and spirits manufactured elsewhere than in South Africa will be observed.

The main decreases are:—Fodder and forage, £42,067; milk or cream, £39,783; fresh fruit, £2,288; eggs, £1,494; under corn, grain and flour decreases shew in oats, £18,031; maize meal, £8,425; and bran, £10,664; the decrease in meats is £172,637.

The large decrease in the imports of fodder and forage seems to indicate that the farmer is at last awake to the fact that the proper place to grow these articles is the farm on which the animals are kept. In the year 1904-5 our imports under this head were £175,551; in the year 1905-6, £145,222; this year the imports only amount to £103,155, and we sincerely hope that the day is not far distant when we shall be able to produce all the forage required in the Transvaal.

Exports.—Our exports of farm produce for the period under review amount to £659,371; this amount does not perhaps seem large when compared with our imports, but when it is stated that the exports for the previous year only amounted to £515,561—a difference of £143,810—then, indeed, it will be seen that the country has progressed materially from an agricultural standpoint.

The following are those items shewing the larger increases:—Tobacco, £8,077; wool, £51,032; fodder and forage, £1,412; coffee, £2,324; plants, bulbs and trees, £740; the total increase under the head corn, grain and flour is £38,745—the great difference being shewn under the item maize. In 1905-6, our exports of maize only amounted to *£2,107*, while this year the statistics shew the

astounding total of *£30,059*. Kaffir corn also shews a marked rise, the increase being £6,619 ; exports of mohair have risen from £19,097 to £20,570. One of the most notable of the increases is shewn under the head hides and skins, and amounts to £39,734.

The principal decreases are :—Butter and butter substitutes, £721, and wines and spirits, £789.

Speaking generally, the figures indicate that good progress has been made, and that the farmers are doing their best to fulfil the demand for farm produce, but it is well to bear in mind the fact that the Transvaal still imports goods to the value of *£4,458,765*, all of which could be produced in this Colony, and that it cannot, by any means, yet be described as a self-supporting country. However, sufficient progress has been made to shew that the country is improving agriculturally, and another year will doubtless bring further substantial reductions in the amount of our imports.

When we consider the figures in regard to exports there is even greater cause for congratulation, because the statistics relating to the staple crops of the Transvaal, *i.e.*, tobacco, wool, maize and Kaffir corn, all shew very marked increases.

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Wheat.

NEXT to mealies the problem of wheat growing is the most interesting question for the Transvaal farmer. During the last few months we have heard a great deal about the possibility of a wheat famine. For many years wheat has been steadily rising in price, and there seems to be no doubt that the era of cheap wheat has passed away if we may judge from the gradual increase in the price since it touched the lowest figure on record, namely, 17s. per quarter (480 lbs.). The reason why wheat dropped to that low figure —which certainly did not pay the English farmer—was owing to the keen competition of the virgin lands of America, Canada, Russia, and Australia. It is satisfactory to note that prices are gradually settling down to a paying level. In Great Britain anything below 30s. a quarter is not counted a paying crop owing to the heavy cost of growing grain. A short time ago 40s. was reached. Ten years ago, in the State of Minnesota, 80 cents per bushel (3s. 4d. per 60 lbs.) used to be considered a good price ; the other day American wheat rose to $1.7 (4s. 5d.). Again, it is instructive to note that the average yield of wheat in the United States is 14 bushels to the acre, in the Argentine 13, in Canada 19, in Great Britain 31, and in Denmark 41.2 bushels. The remarkable averages of the last two countries are due to thorough tillage, heavy stocking of the land, and the scientific use of manure.

A recent writer, Professor Silvanus Thompson, seems to think that the insufficiency of the world's wheat crop will be met by the new chemical fertiliser called nitrate of lime which is now being

manufactured by the Norwegian Nitrate Company. It is outside our province to discuss the value of nitrate of soda (Chili saltpetre) or the new fertiliser nitrate of lime in wheat growing, but we refuse to believe that a world famine is near at hand when we reflect upon the limitless wheat fields still awaiting the settler and the plough—which extend 500 miles to the north of the City of Winnipeg, and westward for nearly a thousand miles right up to the foot hills of the Rockies. Nor do we set so much faith upon the ultimate use of commercial manures when we remember that the enormous wheat crops of both Western America and North-Western Canada are largely raised without the aid of artificial stimulants.

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But of this we are certain that the farmers in the New World are realising more and more the need of better tillage. It is astonishing to note that this English scientist appears to have ignored the importance of good tillage in wheat cultivation. Now, the average yield for the State of Kansas is 13 bushels per acre, but, at Manhattan, where the Kansas State College is situated, Professor Ten Eyk showed us experimental wheat averaging over 50 bushels to the acre—unmanured—the result of dry land farming. For us in the Transvaal this is a most important point. We can grow good wheat on our irrigated land. Why should we not make an earnest effort to raise it upon our dry lands? It is done in the O.R.C., and it has been done in one or two cases in our own Colony. We believe that by ploughing the lands in the summertime, keeping them loose by cultivation, and so accumulating the rainfall for, say, half a year, and holding it in the soil wheat might be successfully grown. At any rate we should like our farmers to give us the benefit of their experience in this matter.

The Transvaal Horticultural Society.

The first annual exhibition of the Transvaal Horticultural Society, which took place in Johannesburg on November 29th, was opened by the Countess of Selborne, and passed off most successfully. This Society has become affiliated with the Royal Horticultural Society of Great Britain, and, in the words of Mr. H. W. Soutter, Chairman of the Society, "it was their ambition that every centre and every dorp in the Transvaal should become a garden. It was not the idea of the Society to encourage those who were fortunate enough to have large gardens. The object of the Society was to encourage those who had a plot; if they had not a plot to encourage those who had a verandah; if they had not a verandah to encourage those who had a window-sill, because they were profoundly convinced that if this country were to be the home of working men they must have their gardens, no matter how small."

The exhibits from the Rand Nurseries and the Municipality of Johannesburg were specially admired. Mention should also be made

of the groups exhibited by Messrs. Barlow & Co., Nylstroom, constructed principally of rustic cork-work 12 feet high and surmounted by graceful Kentia palms. The table decorations were particularly pleasing, and the honey exhibits showed a marked improvement.

The Committee, with their indefatigable Secretary, Mr. Dowdle, deserve to be warmly congratulated on their first show. It is hoped to hold a fruit show sometime in March.

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Swaziland.

NEARLY two years ago we published in this "Journal" a valuable article on the Agricultural and Pastoral Future of Swaziland from the pen of Mr. Allister M. Miller. It is with much pleasure that we now call attention to an excellent handbook by our contributor which has just been issued under the title "Swaziland—The California of South Africa." This well printed and nicely illustrated pamphlet has been published by the authority of the Swaziland Mining, Commercial, and Industrial Chamber, and can be obtained at the Central News Agency for the modest sum of sixpence. The booklet, although issued primarily for the guidance of the farmer and the miner will be read with great interest by the general public; and we must cordially compliment Mr. Miller upon this admirable handbook written in clear and vigorous style.

SINCE the last issue of the "Journal" we have to record with great regret the death of Mr. THOMAS SYDNEY MAXTED, Chief Clerk to the Department of Agriculture, which took place at the Lady Dudley Nursing Home in Johannesburg. Mr. Maxted was born at Canterbury, in Kent, and resided in South Africa for a considerable number of years. Coming up from the Public Works Department of the Cape Civil Service at King Williams Town, some six years ago, he held for a short time the post of Private Secretary to Colonel Thompson, Chief of the Burgher Camps. In 1903, he was appointed to the post of Chief Clerk to the Department of Agriculture, which position he held at the time of his death.

Mr. Maxted, who was associated with the Director of Agriculture, Mr. F. B. Smith, almost since the commencement of the Department, had seen the rapid growth of the administrative branch, and it is not too much to say that the success of the executive of the Department was largely due to the conscientious and energetic manner with which Mr. Maxted carried out the policy of his Chief. Mr. Maxted will be greatly missed by his many friends in the Transvaal, and especially by the members of the Department of Agriculture, where his cheery manner made him a universal favourite and a most genial colleague. Mr. Maxted was unmarried and died at the comparatively early age of thirty-five.

AGRICULTURAL NOTICES.

Veterinary Division.

BLUE TONGUE IN SHEEP.

Vaccine for the inoculation of sheep against this disease can now be obtained at a charge of 1d. per dose on application to any Government Veterinary Surgeon. It will be necessary for farmers to purchase a syringe in order to carry out the inoculation, and the Government Veterinary Surgeon will inform applicants where these instruments can be obtained.

A. THEILER,
Government Veterinary Bacteriologist.

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ARRANGEMENTS FOR FORWARDING PATHOLOGICAL SPECIMENS

It is hereby notified for general information that special arrangements have been made with the Central South African Railways for forwarding pathological specimens for examination in the Veterinary Bacteriological Laboratory, and all such specimens can now be sent carriage forward, if addressed to the Government Veterinary Bacteriologist, Pretoria Station, and distinctly labelled "Scientific Specimens for Examination." The Government Veterinary Bacteriologist is at all times glad to make examinations and to report on pathological specimens, but farmers and others sending such are earnestly requested to write full particulars of the animal from which the specimen has been taken and to post such in time to be delivered before the arrival of the specimen, or, in case of urgency, to telegraph. The importance of doing this is urged since occasionally, when not previously advised, specimens have arrived in too decomposed a condition for examination.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture.
1st October, 1907.

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SPONZIEKTE OR QUARTER EVIL.

Vaccine for the prevention of this disease is now ready for issue at the Government Veterinary Bacteriological Laboratory, and can be obtained through the Government Veterinary Surgeons, who will give instruction in the method of vaccination, and through whom also the necessary instruments can be obtained. The price of the vaccine is 3d. per double dose.

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WARNING TO IMPORTERS.

The attention of the Department has been directed to the fact that certain imported cattle brought into this country under certificates stating that they have been tested with Tuberculin before shipment and have passed the test satisfactorily, have been found to react as infected when re-tested by the Government Veterinary Staff shortly after arrival. For this reason it is suggested that importers of cattle should have such imported animals re-tested by a Government Veterinary Surgeon on arrival at their destination, and before they are allowed to mix with other stock. Should anyone wish to take this precaution the test will be applied free of charge upon application to the Government Veterinary Surgeon of the District to which the cattle are taken, at the earliest convenience of this Officer to whom the application is made.

F. B. SMITH,
Director of Agriculture.

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GLANDERS AND FARCY.

WARNING TO THE PUBLIC.

A considerable number of outbreaks of Glanders having been reported to the Agricultural Department as having occurred in various districts of this Colony during the past few weeks, the public are warned against the purchase of equines

from unknown travelling dealers or on auction sales, unless the animals put up for sale are sold with a written guarantee signed by the owner, certifying that they are free from any contagious disease, as there is no doubt that unscrupulous persons have lately been disposing of infected animals at prices which have tempted the public to purchase the same, and that the disease has subsequently appeared in the stables of purchasers to their loss and detriment.

It is further recommended that all newly purchased equines should be kept isolated and should be watered separately and apart from any other equines on the premises for a period of three weeks after purchase, and should they show any indications suspicious of Glanders, a report should be forwarded at once to the Government Veterinary Surgeon of the District.

The following description of the disease is appended for the information of the public, and special attention is called to Government Notice No. 103 of 1907, which appears underneath.

Glanders and Farcy.

These two names are applied to one and the same disease, which is due to a microbe—Bacillus Malleus. The disease is called Farcy when located on the limbs or body: Glanders when the principal symptoms are seen in the nostrils, submaxillary glands, and lungs.

The horse tribe is most commonly affected with Glanders. Man not infrequently gets the disease from the horse by inoculation through a wound. The dog, the cat, and wild carnivora may be infected. The ox is absolutely immune. Sheep, goats, and pigs are immune for all practical purposes.

A horse may be affected with Glanders and show no symptoms except slight unthriftiness. This is called occult Glanders, and can only be diagnosed by the mallein test.

In typical clinical cases there is a thick grey-coloured discharge from one or both nostrils. Ulcers and ulcerous patches are seen inside the nasal cavities and the glands under the jaw are enlarged and hard. The temperature may be raised, but in chronic cases it may be no higher than the normal. In severe and acute cases the temperature is several degrees above normal and the animal shows distinct symptoms of respiratory disease. In Farcy one or more limbs become swollen. The lymph vessels stand out prominently on the inside of the limbs. The vessels give a cord-like feel to the hand, and small nodules appear along the course of the vessels. These nodules become ulcers which discharge a thick yellow fluid of oily appearance. The ulcers may heal and leave a scar, but they usually break out again. Farcy may also appear on the skin of the neck and body.

One sees the ulcers on the skin if Farcy has been present. Besides what one sees in the live animals, one may also find ulceration of the throat and air passages. The most constant changes are found in the lungs. In acute Glanders, small grey nodules about the size of a pin-head are seen all through the lung substance. In the chronic forms the nodules in the earlier stages appear as small grey patches with a red margin. Others are of pus-like consistence. The older nodules are hard and shot-like to the touch; some of them are gritty—calcification. The number of nodules in a lung varies from one or two to hundreds. The donkey suffers from an acute form of Glanders in which the lungs are inflamed over a large surface. The tissue is solid, and on section the surface of the lung has a greyish red colour.

PORTS FOR ENTRY OF STOCK.

The following are the ports for entry of stock into this Colony from the neighbouring territories :

Bilhrman's Drift	Cape Colony.	(Daily.)
Mosimyani	"	(Saturdays only.)
Christiana	"	(Daily.)
Coal Mine Drift	Orange River Colony.	(Thursdays only.)
Vereeniging	"	(Daily.)
Schoeman's Drift	"	(Mondays & Thursdays.)
Roberts' Drift	"	(Daily.)
Volksrust	Natal.	(Daily.)
Komati Poort, through which stock not provided for under Clause 5, Government Notice No. 834 of 1903, will only be allowed to proceed by rail, to be examined at Machadodorp	Portuguese East Africa.	

Division of Chemistry.

INSTRUCTIONS FOR THE SAMPLING OF SOILS.

In taking soil for analysis, it is of the utmost importance that a truly representative sample be secured, otherwise the labour involved will, to a great extent, be wasted.

Much depends upon the particular object for which the analysis is to be made. If the soil of a farm or field is to be reported upon, and much difference exists in the soil from different parts, each variety of soil should be represented in the final sample by a quantity proportional to the aliquot portion of the whole area covered by that particular soil.

If great differences are known to exist in different parts of the farm or field, better knowledge of the nature of the soil will be obtained, of course, at the cost of greater labour in analysis, if the samples are kept separate.

The *depth* to which a sample is taken is also a matter of importance. In some cases a clear line of separation between the soil proper and the sub-soil is perceptible. This is often shown by difference in colour, the soil being richer in organic matter, and therefore darker than the sub-soil. Under such circumstances the sample of soil should be taken down to the line, and, if necessary, a sample of sub-soil should also be secured. When no distinction is perceptible, the sample should be taken to the depth of one foot.

METHODS OF TAKING SAMPLES.

There are many ways of taking samples of soil. The following, perhaps, will be found most convenient in this country:—

(1) Having selected a representative spot, the vegetation upon it is removed, and a hole is dug with a sharp spade to a depth rather greater than that of the soil proper, or, if no line of separation of soil from sub-soil is perceptible, to about 15 inches. One side of the hole is then trimmed with the spade so as to be smooth and vertical, the hole being cleaned out. A slice of uniform thickness, about 3 or 4 inches, is then removed by the spade down to the necessary depth. This slice is placed on a clean board or sack and mixed with similar slices, obtained in the same way from other parts of the field. Finally, all the samples are thoroughly mixed together with the trowel or the spade, the sticks, large stones, and roots removed, and a portion of six or seven pounds placed, with a label giving details, in a clean box and sent for analysis.

(2) Another, better but more laborious, method is to have wooden boxes, 6 inches square and 12 inches deep, to hold the samples. A large hole is dug with a spade at the selected spot, and a square upright block of soil is left in its centre. This is carefully trimmed with the spade until a box will just fit over it. The upper surface of the block of soil is freed from vegetation, the box inverted over it, and forced down. The spade is next slipped under, and the box with its contents removed, a label giving particulars of the soil put in, and the lid screwed on. In this way a sample of the soil (and often the sub-soil, *in situ*) is obtained, which can be examined in the laboratory.

WHAT TO DO WITH THE SAMPLES.

In all cases full details as to the exact locality, date of collection, depth, crops borne, previous manurial treatment, and other circumstances connected with the soil should be enclosed with the sample. These should be written in pencil, as ink is apt to become damp and run.

Samples should be sent by passenger rail, addressed to me at the Agricultural Chemical Laboratories, Pretorius Street, Pretoria, and advice of their despatch, together with details of the samples, should be sent by post to the same address.

While every effort will be made to deal with the samples as soon as possible, for a time, at least, some delay may be unavoidable, owing to the large accumulation of material awaiting analysis. *No attention will be paid to samples sent without the full details stated above.*

A list of charges for the analysis of soil and other products is published below, but in cases where it is considered that the results may be of sufficiently general interest, if published, no charge will be made.

HERBERT INGLE,
Chief, Division of Chemistry.

SCHEDULE OF CHARGES FOR ANALYSIS MADE IN THE AGRICULTURAL LABORATORIES.

	£	s.	d.
1. Estimation of one constituent in a manure or feeding stuff ..	0	7	6
2. Estimation of two or three constituents in a manure or feeding stuff	0	15	0
3. Complete analysis and valuation of a manure or feeding stuff ..	1	0	0
4. Analysis of water—drainage or irrigation	1	5	0
5. Partial analysis of a soil to determine fertility and manurial needs	2	0	0
6. Complete analysis of a soil	3	0	0
7. Analysis of milk, cream, butter, or cheese	0	10	0
8. Milk—determination of fat and total solids	0	5	0
9. Milk—determination of fat only	0	2	6
10. Butter—determination of water and fat	0	5	0
11. Analysis of a vegetable product—hay, ensilage, roots, etc.	1	0	0

At present no charge will be made to *bona fide* farmers. The charges in the above schedule refer to products sent by manure merchants, milk dealers, or others interested in trade. Samples will only be accepted if assurance can be given that they are properly taken and truly representative of the bulk. The right of publishing the results of any analysis is reserved by the Department. Should the examination of any product furnish results which are deemed of sufficient general interest, the charges may be remitted.

Samples of any product likely to be of agricultural importance will gladly be received.

Division of Botany.

POISONOUS PLANTS.

The Division of Botany and Division of Veterinary Science are carrying on a series of joint investigations on the poisonous plants of the Colony, their effect on stock, and the remedies to be applied.

Last year we invited farmers to send specimens of poisonous plants for identification and are glad to be able to extend the invitation this year.

Any farmer who has poisonous plants on his farm, and would like information about them, may send samples to the Department for investigation. These samples will be identified and named, will be tested on animals kept for the purpose, the symptoms will be carefully diagnosed, and different remedies will be tested. A report of the results will be sent to the person furnishing the specimens.

For an effective test, samples of at least 5 lbs. of the material should be sent, but smaller samples will also be welcome for identification and preliminary report.

Through the courtesy of the Postmaster-General, specimens may be sent by post, free of charge, if fastened up as letters and addressed:—

O.H.M.S. LETTER POST.
The Government Botanist,
Department of Agriculture,
P.O. Box 434,
Pretoria.

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INJURIOUS WEEDS.

Owing to the fact that of late several newly-introduced and injurious weeds have made their appearance in the Transvaal, farmers are earnestly requested to take careful notice of any new plants which have appeared on their farms and which seem to have a tendency to spread. When such are discovered, specimens of the plant bearing flowers and, if possible, fruit should be forwarded to the Government Botanist by whom they will be examined and reported upon. They should be forwarded in the same way as specimens of poisonous plants.

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SEED SALES BY THE DEPARTMENT OF AGRICULTURE.

The Division of Botany has lately received a large number of requests to sell farm seeds in bulk, and farmers are requested to note that the only seeds which this Division is prepared to sell are Lucerne, in lots not exceeding 50 lbs. at 1s. per lb., and Teff seed, in quantities not exceeding 10 lbs., at the same price per lb. As a rule, reliable seed of all the more common Transvaal crops can now be purchased from local seed merchants.

SEED DISTRIBUTION.

A list of seeds available for farmers who are willing to conduct experiments in co-operation with the Division has been published as Bulletins No. 1 and 2, printed in Dutch and English, and may be obtained on application to the Government Printer. Terms on which the seeds will be issued are stated in the Bulletin, and application forms will be found within the cover. Notes are given as to the uses of the plants and as to how the seed should be treated.

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COCKLE-BURR.

On account of the dangerous character of this weed to wool and mohair growers, farmers on the Aapjes, Pienaars, and Crocodile Rivers are advised to keep a sharp look-out for its appearance, especially on the banks of the rivers, and to root out the plants before they go to seed. Any farmer who is in doubt as to the identity of Cockle-Burr can send specimens to the Botanist for identification.

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CO-OPERATIVE EXPERIMENTS: COTTON.

Cotton Seed Donated by the British Cotton Growing Association.

The Department has received a large consignment of American Upland Cotton Seed from the British Cotton Growing Association. This seed will be distributed to any *bona fide* farmer who wishes to give the crop a trial, in sufficient quantity to sow one acre (209 x 208 English feet).

The amount of seed required will be as follows:—

For the Low Veld, sowing 4 x 3 feet, 3 lbs. of seed.
„ Middle Veld „ 4 x 1½ „ 5 to 6 lbs. of seed.
„ High Veld „ 4 x 1 „ 7 to 9 lbs. of seed.

(The thicker sowing is advisable at higher altitudes where the climate is rather cooler.)

The farmer is required to pay all carriage and transport charges from Pretoria to his farm (freight from America to Pretoria has been paid by the Association and the Department).

The farmer must sign and return the attached form of agreement either to the Government Botanist or to the Resident Magistrate.

This agreement is made necessary by the conditions under which the Association has supplied the seed. These conditions read "That all the cotton grown from this seed shall be shipped to the Association for sale, and if the experiment proves successful the cost of the seed shall be refunded to the Association, that other experiments may be conducted; . . . if the experiments are a failure they (the farmers) will be called upon to pay nothing; if successful, the Association will dispose of the cotton for their account, and deduct the cost from the proceeds."

The Association has agreed to supply the Department with two hand-gins, which we intend to loan out to each district. Application for the use of these gins should be made in due course to the Resident Magistrate.

A pamphlet entitled "Hints on the Cultivation and Harvesting of Cotton," has been issued by the British Cotton Growing Association; a few copies are still available, one of which will be sent to each farmer receiving seed, as long as the supply holds out.

For further information on Cotton Cultivation, etc., growers are referred to the articles and notes which have appeared in the "Transvaal Agricultural Journal" during the last 18 months, particularly the following:—

Cotton Growing in the Transvaal: "Agricultural Journal," No. 12, pp. 739-745. (July, 1905.)
Cotton as a Possible Crop for the Transvaal: No. 8, pp. 595-599. (July, 1904.)
How to Estimate the Yield of Cotton-lint per Acre: No. 9, p. 174.
Weight of a Bale of Cotton: No. 9, p. 174.
Transvaal Cotton; Reports from the Imperial Institute: No. 9, pp. 136-137; No. 11, pp. 554—556.
Cotton in South Africa: No. 9, pp. 130-131.
Transvaal Native Cottons: No. 9, p. 131 and pp. 136-137.
Cotton in the Low Veld of the Eastern Transvaal: No. 10, p. 316.
Zoutpansberg Cotton: No. 9, pp. 136-137; No. 11, p. 554.

Swaziland Cotton: No. 9, p. 137.
Cotton in the Marico and Rustenburg Districts: No. 12, pp. 863-864 and 842.
Cotton at Malelane: No. 13, October, 1905, pp. 152-155.

JOSEPH BURTT-DAVY,
Government Agrostologist and Botanist.

THE GOVERNMENT AGROSTOLOGIST AND BOTANIST,
TRANSVAAL DEPARTMENT OF AGRICULTURE,
P.O. Box 434,
PRETORIA.

CO-OPERATIVE EXPERIMENTS: COTTON.

SIR,

Please forward me by* ....
carriage forward, to ....Station, in care of ...., Forwarding Agents, ...lbs. of cotton seed.

I agree to furnish you with a full and accurate report, at the end of the season, as to the results of the experiments, on the forms to be supplied by you.

In the case of the experiment being successful, I also agree to ship the whole of my crop of cotton to the British Cotton Growing Association for sale, and I will allow the aforesaid Association to deduct the cost of the seed from the proceeds thereof.

Date ....

Sign here ....

Two witnesses. ....
....

Full P.O. Address ....
....

* State whether the seed is to be sent by Passenger or Goods Train or by Parcels Post. If it is to be sent by Post, 8d. per lb. for postage should be enclosed with the application.

Division of Forestry.

SALE OF HEDGING FROM IRENE NURSERY.

It is hereby notified for general information that the sale of Hedge Plants from Irene Government Nursery has been discontinued. Forest trees will be disposed of as formerly.

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The price list of seeds and trees supplied by this Division can be obtained free of charge on application to the Conservator of Forests, or the Government Printer, Pretoria.

Division of Horticulture.

CONTINUATION OF NURSERY WORK BY THE HORTICULTURAL DIVISION.

The present opportunity is taken of notifying farmers generally that the propagation of young fruit trees for sale at the various Experimental Orchards and Nurseries of this Division will be re-commenced immediately, but trees will not be available for disposal until July, 1909. By this date it is expected that a good number of trees will be available, and they will comprise such varieties as have proved to be suitable for the various districts of the Transvaal by actual test at the different Experiment Stations.

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PURCHASE OF PEACH PITS.

The Government Horticulturist is occasionally asked to supply information as to where pits of the Transvaal Yellow Peach may be obtained, and occasionally a few sacks are needed by this Department for seed purposes.

Pits should be spread out in the shade and then put in sacks when thoroughly dried. They are worth then about 10s. a sack, and anyone having same for sale in good condition is requested to write to the above-named officer who will at once give all possible help in disposing of them.

SALE OF FRUIT TREES, VINES, CUTTINGS, SCIONS, ETC.

It is notified for public information that in future payment must be made for goods on or before delivery. When purchasers mention a railway station to which packages may be consigned for them, advantage may be taken of the "Collect on Delivery" system of the C.S.A.R. In all other cases cash should accompany the order, but it is advisable prior to remitting same that enquiries be made of the Government Horticulturist as to the ability of the Division to supply the trees ordered.

Tobacco Division.

TOBACCO PLANT DISEASES.

A large number of letters and verbal inquiries have been received by the Tobacco Division in regard to diseases and insects injurious to tobacco plants. It is impossible to give any reliable advice as to remedies for different diseases and insect pests unless a specimen of the affected plant is forwarded to us, and our readers are, therefore, requested to furnish a portion of the affected plant when writing for advice in such matters. Most of the diseases and insect pests which attack tobacco plants in the Transvaal are easily controlled. Letters, but not parcels, may be sent free of charge if addressed as follows:—

O.H.M.S.
The Government Tobacco Expert,
Department of Agriculture,
Pretoria.

Editorial Division.

AVAILABLE PUBLICATIONS.

The following publications, amongst which are included several recent additions, can be had, free of charge, on application to the Government Printer, Box 373, Pretoria:—

Transvaal Agricultural Journal,	No. 3, Vol. I.	(Published quarterly).
" " "	No. 4, Vol. I.	" "
" " "	No. 13, Vol. IV.	" "
" " "	No. 14, Vol. IV.	" "
" " "	No. 15, Vol. IV.	" "
" " "	No. 16, Vol. IV.	" "
" " "	No. 17, Vol. V.	" "
" " "	No. 18, Vol. V.	" "
" " "	No. 21, Vol. VI.	" "

Division of Botany:—

Leaflet No. 1.—"Plants Poisonous to Stock."
" No. 4.—"The Cockle-Burr" (English and Dutch).
Bulletin No. 1.—"The Conditions of Seed and Plant Distribution," 1906-7.
" No. 2.—"The Conditions of Seed and Plant Distribution," 1907-8.
Circular No. 1.—"Poisonous Plants" (English and Dutch).

Division of Entomology:—

Leaflet No. 5.—"The Fowl Tick."
" No. 6.—"Cockchafers and Flower Beetles."
" No. 7.—"Sprays for Locust Destruction" (English and Dutch).
" No. 10.—"Notes on Termites."

Division of Forestry:—

"Price List of Seeds and Trees" (English and Dutch).

Division of Horticulture:—

Bulletin No. 1.—"Some Information about Fruit Trees" (English and Dutch).
Leaflet No. 3.—"A Fruit Report" (English and Dutch).
" No. 4.—"Diseases of Orange Trees" (Dutch and English).

Division of Publications:—

Bulletin No. 1.—"Burrweed or Boete Bosch."
" No. 2.—"Some Diseases of the Horse."
" No. 3.—"The Food of Plants."
" No. 6.—"City and Town Milk Supply and the Care and Aeration of Milk" (English and Dutch).

Division of Veterinary Science:—

Bulletin No. 1.—"Measles in Swine and Cattle" (English and Dutch).
" No. 6.—"Contagious Abortion" (English and Dutch).
Leaflet No. 3.—"Rhodesian Tick Fever" (English and Dutch).
" No. 5.—"Glanders and Farcy."
" No. 4.—"Directions for Preparing Blood Smears." (Dutch.)
" No. 6.—"Wire Worms."

Miscellaneous:—

Agriculture within the Empire.
Bulletin No. 1.—Department of Irrigation and Water Supply: "The Design and Construction of Small Reservoirs for Irrigation and for Stock."
" No. 2.—Department of Irrigation and Water Supply: "The Design and Construction of Small Irrigation Canals."
" No. 3.—"The Brands Directory, 1906."
Annual Report of the Director of Agriculture for the year 1903-4.
" " " " " 1904-5.
" " " " " 1905-6.

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JOURNAL FILES.

In order that our numerous readers may not be disappointed by being unable to complete their files, we would earnestly request them to preserve all copies of the "Journal" if they propose to bind them at the close of the year. Owing to the expense incurred in publication, it has become necessary to limit the number of copies issued, and it often happens that we cannot supply back numbers, as they are out of print.

Indices for the "Agricultural Journal," Vol. I., Vol. II.,Vol. III., Vol. IV. and V., can be had on application to the Department of Agriculture.

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JOURNAL DUPLICATES.

Any readers who possess and can spare duplicates of the "Agricultural Journal" would confer a great favour by returning them to the Department of Agriculture, as back numbers are now out of print, and applications are constantly being made by persons desirous of completing their sets.

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APPLICATIONS FOR THE "JOURNAL" AND NON-DELIVERY.

Applications to be placed on the Mailing List of the "Journal," as well as complaints as to non-delivery of the "Journal," should be addressed to the Government Printer, P.O. Box 373, Pretoria, and not to the Editor of the "Journal." It is particularly requested that changes of address should also be promptly notified to the Government Printer, in order to ensure prompt delivery to addressees and to avoid unnecessary correspondence.

"The Transvaal Agricultural Journal" is issued free to residents in the Transvaal only.

Persons residing in the other South African Colonies or Oversea may become subscribers by paying an annual subscription of 7s., post free, starting from July in each year; 2s. extra is required for postage oversea.

Subscriptions are payable strictly in advance, and should be made by bank draft, money order, bank notes, or coin. Cheques cannot be accepted in payment, unless initialled by the Bank authorities.

All correspondence must be addressed and payments made to the Government Printer, Box 373, Pretoria.

Ermelo Stud Sheep Farm.

GOVERNMENT MERINO RAMS FOR PUBLIC STUD.

A limited number of duly qualified Ewes will be accepted for service after the 1st of October.

The Rams available for service comprise:—

1. Imported Tasmanian Rams (President Strain).
2. Pure Tasmanian Rams, bred on the Farm.
3. Rambouillet Rams, imported direct from France.

Service fees range from 5s. to 10s. per ewe. An Agistment Fee (feeding fee) of 6d. per sheep per week will also be charged. All sheep must be removed on receiving notice from the Manager. The right is also reserved to refuse unsuitable sheep. No responsibility is accepted by the Agricultural Department, but all reasonable care will be taken of Ewes while on the Government Farm. Applications should be addressed to the Manager, Stud Sheep Farm, Ermelo.

F. B. SMITH,
Director of Agriculture.

Office of Director, Pretoria.
1st October, 1907.

Experimental Farm, Potchefstroom.

STALLION AT STUD.

The "Clydesdale" Stallion "Transagric," sire Royal Chief (10,876), dam Minnie (Vol. 28), by Baron's Pride (9,122), grand dam Brenda II. (12,871), by Macgregor (1,487), will stand at Stud at the Experimental Farm, Potchefstroom, at the service fee of £2 2s., payable at the time of service.

"Transagric" won the gold medal at the Johannesburg Show of the Witwatersrand Agricultural Society, 1907, for the best Clydesdale exhibited. He is a black horse, about 16 hands 1 inch, on strong and short limbs, and full of substance and quality. He is recommended for breeding horses for van or draught purposes.

Arrangements can be made with the General Manager, Experimental Farm, Potchefstroom, for mares to remain at the farm during the service season at reasonable charges for keep and attendance.

ALEX. HOLM,
General Manager.

* * * *

PIGS FOR DISPOSAL.

Young pure-bred boars and sows of the Large Black, Berkshire, and Large White Yorkshire breeds will be available for disposal in February and later. Age, 4½ to 6 months old. Price, 50s. to 70s. each, according to size and quality.

* * * *

SEEDS FOR DISPOSAL.

Potatoes. Early and medium early varieties are expected to be ready for planting in February. This seed is only recommended for warm districts. Price, 15s. per bag of 160 lbs., f.o.r. Potchefstroom.

Wheat, Oats and Rye. Early and late varieties.

Barley. "Kinver Chevalier" Malting.

Price of wheat, oats, rye and barley, 12s. 6d. per 100 lbs., f.o.r. Potchefstroom. Prices are subject to alteration without notice.

These seeds consist of different varieties which have been experimented upon at this farm, and have proved valuable, and the crops thereof have been specially grown and managed for seed purposes.

The amount of seed which will be issued to any one farmer will be determined by the amount available and the applications received.

Orders must be accompanied by cheque or postal order, and the "seeds" will be allotted according to priority of application.

For full particulars and any other information apply to the General Manager, Experimental Farm, Potchefstroom.

General Notices.

LIST OF FARMERS' ASSOCIATIONS AND AGRICULTURAL SOCIETIES IN THE TRANSVAAL.

Aapjes River Ward Agricultural Society, A. F. van Gass, Pyramid Station.
Aapjes River Ward Farmers' Association, F. N. Carlisle, Pyramid Station.
Barberton Farmers' Association, Geo. E. O. Wilhelm, Box 157, Barberton.
Barberton Agricultural Society, G. S. Dyce, Box 5, Barberton.
Belfast Agricultural Society, O. J. Oosthuizen, Box 13, Belfast.
Bloemhof Agricultural Society, Izaak Hoffmann, Bloemhof.
Carolina Agricultural Society, M. van Enter, Box 43, Carolina.
Christiana Agricultural Society, A. P. Bargers, Box 27, Christiana, Secretary.

Crocodile River Farmers' Association, J. H. Schoeman, Rietfontein W., Pretoria.
Devon Farmers' Association, J. H. R. Moodie, P.O. Devon.
Eastern Transvaal Farmers' Association, T. W. Snaith, Box 75, Springs.
Ermelo Agricultural Society, A. Smuts, Box 5, Ermelo.
Elands River Farmers' Association, E. H. Eloff, Rietvlei, Lindley's Poort, Rustenburg.
Grootspelonken Farmers' Association, J. W. Walton, Private Bag, Middagzon, Pietersburg.
Haenertsburg Farmers' Association, P. Kent, Spitzkop, Haenertsburg, *via* Pietersburg.
Heidelberg Agricultural Society, W. Harvey, Box 36, Heidelberg.
Heidelberg Burgher Land Settlements, Balfour.
Hekpoort Farmers' Association, Secretary, *via* Krugersdorp.
Hex River Farmers' Association, W. Breedt, Hex River, Rustenburg.
Highveld Farmers' Association, F. Findley, Ceylon, *via* Krugersdorp.
Highveld Farmers' Association, W. Robinson, Rustenburg.
Klerksdorp Agricultural Society, H. Bramley, Box 56, Klerksdorp.
Klip River Farmers' Association, Krugersdorp.
Koesterfontein Farmers' Association, Secretary, *via* Krugersdorp.
Krugersdorp Farmers' Association, G. Figulus, Box 188, Krugersdorp.
Krugersdorp Agricultural Society, H. A. von Blommestein, Box 368, Krugersdorp.
Lydenburg Agricultural Society, S. Hiemstra, Box 69, Lydenburg.
Lydenburg Farmers' Association, E. de Souza, Lydenburg.
Leeuwdoorns Farmers' Association, W. H. Pilkington, Baviaans Poort, *via* Leeuwdoorns.
Low Country Farmers' Association, A. W. Gale, Middelrand, P.O. Devilskloof, Zoutpansberg, N. Transvaal.
Marico Agricultural Society, S. J. van der Spuy, Box 83, Zeerust.
Maquassi Farmers' Association, A. E. Grigson, Maquassi Station.
Middelburg Agricultural Society, J. W. Henwood, Box 229, Middelburg.
New Scotland Farmers' Association, H. S. Parry, Grasdal, Lake Chrissie.
New Agatha Farmers' Association, Henry W. Molyneux, Mashutiesberg, *via* Pietersburg.
Pietersburg Agricultural Society, J. W. Johnson, Box 32, Pietersburg.
Pietersburg Farmers' Association, G. G. Munnik, Pietersburg.
Pietersburg Poultry Club, H. Moore, Box 103, Pietersburg.
Piet Retief Farmers' Association, K. P. van Dijk, Box 18, Piet Retief.
Pisanghoek Farmers' Association, W. J. Birchill, Diana, *via* Pietersburg.
Platrand Farmers' Association, A. H. Barron, Platrand.
Potchefstroom Agricultural Society, Joubert Reitz, Box 152, Potchefstroom.
Potchefstroom Burgher Land Settlements: The Manager, Box 172, Potchefstroom.
Potgietersrust Fruitgrowers' and Planters' Association, H. J. Ströbel.
Pretoria Agricultural Society, H. Cornforth, Box 685, Pretoria.
Rand Poultry Club, F. H. Stoll, Box 2712, Johannesburg.
Rustenburg Farmers' Association, Leo Machol, Rustenburg.
Settlers' Association, Hon. H. Wyndham, Kroondraai.
Southern Waterberg Farmers' Association, C. M. Quarry, P.O. Warmbaths.
Standerton Agricultural Society, J. J. Bosman, Box 26, Standerton.
Transvaal Agricultural Union, F. T. Nicholson, Box 134, Pretoria.
Transvaal Farmers' Association, E. W. Hunt, Box 3785, Johannesburg.
Transvaal Land Owners' Association, H. A. Baily, Box 1281, Johannesburg.
Transvaal Poultry Club, M. Lochhead, Box 134, Pretoria.
Transvaal Stockbreeders' Association, F. T. Nicholson, Box 134, Pretoria.
Transvaal Tobacco Growers' Association, Capt. C. A. Madge, Secretary, Box 4303, Johannesburg.
Transvaal Con. Land Company, Capt. C. A. Madge, Box 4303, Johannesburg.
Trichardts Farmers' Association, E. v. Deventer, P.O. Trichardts, Springs.
Vaal River Farmers' Association, J. van Zijl, *via* Potchefstroom.
Waterberg Agricultural Society, J. von Backstroom, Box 7, Nylstroom.
Wakkerstroom Agricultural Society, G. Maasdorp, Box 87, Volksrust.
Witfontein Farmers' Association, J. Krugel, *via* Krugersdorp.
Witwatersrand Farmers' Association, H. J. A. Wentworth, P.O. Craighall, near Johannesburg.
Witwatersrand Dairy Farmers' Association, Alex. Sloan, Box 5908, Johannesburg.
Witwatersrand Agricultural Society, W. H. Poultney, Box 4344, Johannesburg.
White River Farmers' Association, Archibald T. Ralls, White River, *via* Nelspruit.
Wolmaransstad Farmers' Association, F. W. Konig, Box 1, Wolmaransstad.
Wolmaransstad Agricultural Society, W. D. de Greef, Wolmaransstad.
Wonderfontein Farmers' Association, Secretary, *via* Krugersdorp.
Woodbush Farmers' Association, Secretary and Treasurer, Percy Kent, Spitskop, P.O. Haenertsburg.
Zwartkop Farmers' Association, M. Vorster, Zwartkop, *via* Krugersdorp.
Zwartruggens Farmers' and Planters' Association, G. R. Wedderburn, J.P., Broadwood Vale, P.O. Kosterfontein, Rustenburg.
Zoutpansberg Agricultural Society, J. W. Johnston, Box 82, Pietersburg.

OTHER COLONIES.

Agricultural Union of Cape Colony, D. M. Brown, Box 187, Port Elizabeth.
Bloemfontein and O.R.C. Agricultural Society, J. Fraser, Box 250, Bloemfontein.
Cape Central Farmers' Association, H. C. Hall, Bedford, Cape Colony.
Cape Stud Breeders' Association, J. Pike, Box 703, Capetown.
Natal Agricultural Union, D. M. Eadie, Timber Street, Pietermaritzburg.
Orange River Colony Central Farmers' Association, W. B. Fowler, Secretary, Hill's Buildings, Maitland Street, Bloemfontein.
Orange River Colony Stockbreeders' Association, Secretary, Bloemfontein.
Rhodesian Agricultural Union, Secretary, Box 135, Salisbury, Rhodesia.
South African Co-operative Union, A. C. Lyell, Box 574, Bloemfontein, O.R.C.
Upper Klip River Farmers' Association, Secretary, Vrede District, O.R.C.

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TRANSVAAL LAND AND AGRICULTURAL BANK.

Application for Loans.

It is hereby notified for general information that applications for loans from the Transvaal Land and Agricultural Bank will be received on and after the 4th November, 1907.

The Offices of the Bank have been opened at the Bourke Trust Chambers, Church Square, Pretoria, and all business must be done personally or through a Resident Magistrate, Assistant Resident Magistrate or Resident Justice of the Peace.

Forms of application are now ready and can be obtained from the Officials of the Bank and all Magistrates.

It is to be particularly observed that all applications should be made and lodged by the Applicants themselves, and not through Agents or second parties, and applications made by any other parties than the Applicants themselves will not be considered or acknowledged.

The Officials of the Bank and Magistrates will give all required information and will render all necessary assistance in the completion of forms of the application and otherwise.

Loans not exceeding in amount 60 per cent. of the agricultural and pastoral value will be made upon the security of freehold and quitrent land, and not exceeding 50 per cent. of its value, upon the security of land held under the Occupation Law.

The advances may be obtained either as a fixed loan repayable in one sum after a period not exceeding five years or as an instalment loan repayable by half-yearly instalments during a period not exceeding twenty-five years, with interest calculated at a rate not exceeding 6 per cent. per annum.

Except in special cases no advances will be made of amounts less than £50 and exceeding £2,500.

Insurance will not be specially required for the purposes of these loans as the advances will be made upon the basis of the value of the land irrespective of buildings.

Loans to Co-operative Societies which have been approved by the Minister of Agriculture will be made both on a fixed and instalment basis upon the value of raw or manufactured produce for the purposes and upon the conditions set forth in Section 30 of the Land and Agricultural Bank Act No. 26 of 1907.

All applications for loans must be accompanied by:

(1) A valuation of the property offered as security which should be made by a person duly approved of by the Magistrate.

(3) Fees upon the following scale:

On application not exceeding £200	£1
On application exceeding £200 and not exceeding £500 ...	£2
On application exceeding £500 and not exceeding £1,000 ...	£3
and for every additional £1,000 or part thereof... ...	£1

In the event of the loan being declined without any special valuation of the property having been made the fees less 10s. will be returned.

THOS. B. HEROLD,
Chairman.

Office of the Transvaal Land and Agricultural Bank,
Bourke Trust Chambers, Church Square,
Pretoria, 16th October, 1907.
P.O. Box 375.

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CENTRAL SOUTH AFRICAN RAILWAYS.

Export of Mealies Oversea.

Reduction in Rates on and from January 1st, 1908.

Arrangements have now been completed for the conveyance of Mealies for Export Oversea from any station on the Central South African Railways to the ports of Capetown, Port Elizabeth, East London, Durban and Lourenço Marques at present special rates with a

minimum of 6s. 8d. and a maximum of 10s. per ton (2,000 lbs.), owner's risk, and will come into force on and from January 1st, 1908. The rates include handling, stacking and transferring of the grain to the vessel at the port.

The Administration cannot undertake to load grain at all despatching stations, but such assistance as circumstances permit will be given.

The Governments reserve the right to apply the foregoing rates only to mealies which have been certified by a duly appointed Government Grain Officer as free from dirt, well bagged, and of such quality as is calculated to maintain the standard of South African Mealies in British and other European markets.

Grain will only be accepted for conveyance subject to traffic conditions.

Arrangements are in progress for the through booking of mealies to London for disposal by an agent appointed by the Agent-General of the Transvaal on behalf of senders who desire to take advantage of such facilities. Full particulars will be published as soon as the details have been completed.

For further information *re* shipping freights, Customs formalities and procedure, apply to the Chief Traffic Manager, Headquarter Office, Johannesburg.

F. R. PRICE,
General Manager.

Johannesburg,
30th December, 1907.

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LIST OF OFFICIALS.

The following is a list of the officials of the Transvaal Department of Agriculture, to whom inquiries respecting matters connected with agriculture may be addressed:—

Director	F. B. SMITH.
Division of Veterinary Science:	
(a) Bacteriology	A. THEILER.
(b) Contagious Diseases	C. E. GRAY.
Division of Chemistry	HERBERT INGLE.
Division of Botany	J. BURTT-DAVY.
(a) Plant Pathology	I. P. POLE-EVANS.
(b) Seed Introduction and Plant Experiments	H. G. MUNDY.
Division of Forestry	CHARLES E. LEGAT.
Division of Entomology	C. W. HOWARD.
Division of Horticulture	R. A. DAVIS.
Division of Tobacco	J. van LEENHOFF.
Division of Publications	WILLIAM MACDONALD.
Division of Poultry	REGINALD BOURLAY.
Government Stud Farm, Standerton	A. McNAE
Government Stud Sheep Farm, Ermelo	V. BOSSLEY.
Government Experimental Farm, Ermelo	H. NICHOLSON.
Government Experimental Farm, Potchefstroom	ALEXANDER HOLM.
Government Experimental Farm, Tzaneen	—
Superintendent of Co-operation	B. STILLING-ANDERSEN.
Translator	OTTO MENZEL.
Registrar of Brands	J. J. PIENAAR.
Librarian	S. W. WAGSTAFF.

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ADDRESS.

Correspondents are earnestly requested to give their full name and correct postal address when forwarding any communication to the Department. It sometimes happens that readers send their farm address only, and fail to give the Post Office address, consequently it is impossible to reply to their queries or send publications. This refers more especially to farmers applying for cattle permits, as in many cases letters forwarded by the Veterinary Division are returned by the Postal Authorities to the effect "Not delivered. Address insufficient." The Department should also be immediately notified of any change of address.

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AGRICULTURAL SHOWS.

At the recent Conference of the Transvaal Agricultural Union the following dates were provisionally fixed for Agricultural Shows to be held in the Transvaal during the year 1908:—

Middelburg	5th February.
Lydenburg	12th February.
Carolina	15th February.

Ermelo	27th February.
Ermelo (Government Sheep Sale) ...	28th February.
Volksrust	5th and 6th March.
Potchefstroom	11th March.
Standerton	25th March.
Heidelberg	15th April.
Marico...	22nd April.
Johannesburg	29th April to 2nd May.
Pietersburg	13th May.
Nylstroom	22nd May.
Pretoria	End of May or beginning of June.
Barberton	2nd February (Horticultural).
Barberton	July.
Klerksdorp	January or February (Horticultural).

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The address of the British Cotton Growing Association now is :

Commercial Buildings,
15, Cross Street,
Manchester,
England.

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SOUTH AFRICAN STUD BOOK.

A record of all classes of stock, the object being to encourage the breeding of thoroughbred stock and to maintain the purity of breeds, thus enhancing their value to the individual owner and to the country generally.

Application for membership and entries of stock should be addressed to—

For Cape Colony—J. Pike, P.O. Box 703, Capetown.
For Transvaal—F. T. Nicholson, P.O. Box 134, Pretoria.
For Orange River Colony—E. J. MacMillan, Government Buildings, Bloemfontein.

The South African Stud Book, Volume I., is obtainable from T. Maskew Miller, Adderley Street, Capetown. Price, 10s. 6d.

J. PIKE, *Secretary*,
South African Stud Book Association.

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DEPARTMENT OF IRRIGATION.

Advice to Farmers.

It is hereby notified for general information that the Irrigation Department is prepared to give advice to farmers on any farm relative to irrigation problems, in accordance with regulations approved by the Hon. the Minister for Lands.

Farmers are expected to facilitate the transport of the Irrigation Officials from farm to farm wherever possible.

Application should be made by letter to the Chief Engineer, Irrigation, or to the Resident Magistrate of the District.

F. A. HURLEY,
Chief Engineer, Irrigation.

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EXPORTING DRIED LOCUSTS.

The various South African Railway Administrations have now agreed to charge one-third of the present rough rate to the ports upon any consignments of dried locusts which are forwarded thereto for shipment. The reduced rates per 100 lbs. for the places named will be :—

	Lourenço Marques.	Durban.	East London.	Port Elizabeth.
Pietersburg	1/10	2/4	2/4	-
Pretoria	1/2	1/7	1/7	-
Germiston	1/3	1/6	1/6	-
Standerton	1/8	1/3	-	—
Zeerust	1/6	1/9	1/9	-
Rustenburg	1/5	1/11	1/11	-
Potchefstroom ...	1/7	1/10	1/10	1/8

Johannesburg,
8th October, 1907.

T. R. PRICE,
General Manager, C.S.A.R.

Government Proclamations and Notices.

No. 79 Admn. 1907.]

PROCLAMATION

BY HIS EXCELLENCY THE DEPUTY-GOVERNOR OF THE TRANSVAAL.

Whereas it is desirable to apply the provisions of the "Diseases of Stock Ordinance 1902" to the disease known as "Swine Plague":

Now therefore under and by virtue of the powers in me vested by section six of the said Ordinance I do hereby declare proclaim and make known that the provisions of Ordinance No. 17 of 1902 known as the "Diseases of Stock Ordinance 1902" shall apply to the disease known as "Swine Plague."

GOD SAVE THE KING.

Given under my Hand and the Public Seal at Pretoria this Fourteenth day of September One thousand Nine Hundred and Seven.

HENRY HILDYARD,
Lieutenant-General,
Deputy Governor.

By Command of His Excellency the Deputy Governor in Council.

LOUIS BOTHA,
Minister of Agriculture.

No. 80 Admn. 1907.]

PROCLAMATION

BY HIS EXCELLENCY THE DEPUTY-GOVERNOR OF THE TRANSVAAL.

Whereas by Proclamation No. 26 of 1907 His Excellency the High Commissioner has provided for the imposition of a duty on the export of Angora rams and ewes from Basutoland not less than the amount imposed by the Angora Export Duty Ordinance 1906:

Now therefore under and by virtue of the powers in me vested by section *one* of the Angora Export Duty Ordinance 1906 I do hereby declare proclaim and make known that the duty leviable under the said Ordinance will not be payable on the export of any such ram or ewe to Basutoland.

GOD SAVE THE KING.

Given under my Hand and the Public Seal at Pretoria on this the Fourteenth day of September One thousand Nine Hundred and Seven.

HENRY HILDYARD,
Lieutenant-General,
Deputy Governor.

By Command of His Excellency the Deputy Governor in Council.

LOUIS BOTHA,
Minister of Agriculture.

No. 81 Admn. 1907.]

PROCLAMATION

BY HIS EXCELLENCY THE DEPUTY GOVERNOR OF THE TRANSVAAL.

Whereas by section *five* of Act No. 30 of 1907 entitled "The Ostriches Exportation Prohibition Act" it is provided that the said Act shall come into operation upon a date to be fixed by Proclamation of the Governor in the *Gazette*:

Now therefore under and by virtue of the powers in me vested as aforesaid I do hereby declare proclaim and make known that the said Act shall come into operation on the First day of October 1907.

GOD SAVE THE KING.

Given under my Hand and the Public Seal of The Transvaal at Pretoria this Twenty-fifth day of September One thousand Nine Hundred and Seven.

HENRY HILDYARD,
Lieutenant-General,
Deputy Governor.

By Command of His Excellency the Deputy Governor in Council.

LOUIS BOTHA,
Minister of Agriculture.

GOVERNMENT NOTICE No. 1 OF 1908.

It is hereby notified for general information that His Excellency the Governor has been pleased to approve of the appointment of the persons mentioned in the subjoined Schedule as Field Cornets in the Transvaal from the 1st January, 1908.

F. B. SMITH.

Office of the Director of Agriculture, *Director of Agriculture.*
Pretoria, 1st January, 1908.

APPOINTMENT OF FIELD CORNETS.

PIET RETIEF :—

Piet Retief—Jan Christoffel Greyling Kemp, Box 10, Piet Retief.
Assegaai River—Heinrich Martin Friedrich Meyer, P.O. Wittenberg.

WAKKERSTROOM :—

Wakkerstroom—Gerhardus Johannes Janse van Rensburg, Poortje, Wakkerstroom.
Amersfoort—Gabriel Michael Carel Swart, Vaalbank, Amersfoort.
Volksrust—Christian Burger Pringle, P.O. Volksrust.

STANDERTON :—

Blesbokspruit—Hendrik Johannes Janse van Vuren, Rietvlei, P.O. Blesbokspruit.
Waterval—Johannes Joachim Alberts, Klipdrift, P.O. Val Station.
Klip River—Coenraad Jacobus Brits, Leeuwkraal, P.O. Platrand Station.
Steenkoolspruit—Adam Gilfillan, Dorstfontein, P.O. Onverwacht.
Bethal—Petrus Johannes Dirk Erasmus, Yservarkfontein, P.O. Bethal.

ERMELO :—

Ermelo—Abraham Gerhardus Kleynhans, Vlakplaats, P.O. Brakfontein.
Amsterdam—Johannes Nicholaas Grobler, P.O. Bankkop.
Lake Chrissie—Barend Jacobus Johannes Smit, Box 65, Ermelo.

CAROLINA :

Carolina—Johannes Hieronimus Brink, P.O. Carolina.
Theespruit—William Hendrik de Villiers, P.O. Carolina.
Komati River—Johannes Lodewikus Grobler, Drenthe, P.O. Dalmanutha Station.

BARBERTON :—

Barberton—Hendrik Thomas Watkins, c/o Attorney S. J. van Wijk, Carolina.
White River—Paul Michiel Marits, Kaapsche Hoop.

LYDENBURG :

Steelpoort—Jacobus Nieuwenhuize, Rietfontein, P.O. Boschfontein.
Ohrigstad—Pieter Barend Swart, Uitkomst, P.O. Rustplaats.
Krokodil—David Johannes Schoeman, Rietfontein School, P.O. Rietfontein.
Steenkampsberg—Christiaan Cornelius Cloete Joubert, P.O. Middelburg (*pro tem*).

MIDDELBURG :—

Olifant's River—Gerhardus Wilhelmus van Niekerk, Goedehoop, P.O. Vaalkrantz.
Steenkoolspruit—Joachim Johannes Cornelis van Niekerk, Doornrug, P.O. Balmoral.
Mapochsgronden—Adam Johannes Willemse, P.O. Tonteldoos.
Selons River—Josias Servaas de Kock, Box 3, Middelburg.
Secocoeniesland—Christian Ernst Schutte, Leeuwkraal, P.O. Pokwani.

ZOUTPANSBERG :—

Mara (North)—Marthinus Johannes Petrus Biermann, Bergplaats, P.O. Mara.
Mara (South)—Andries Stephanus David Erasmus, Rustplaats, P.O. Pietersburg.
Marabbastad—Christoffel Hofmeyr, P.O. Marabastad.
Olifants—Ernst Lodewikus Marais, de Diepte, P.O. Thabina.
Groot Spelonken—Johannes Frederik Lodewikus Janse van Rensburg, Rustfontein, P.O. Buffels.
Klein Spelonken—Pieter Willem Möller, Groblerplaats, P.O. Louis Trichardt.
Woodbush—Austin Welsh Wienand, Laatstehoop, P.O. Smitsdrift.
Low Country, Klein Letaba—Jacob Cornelis Boltman, Korthanie, P.O. Duivelskloof.

PRETORIA :—

Crocodile River—Marthinus Nicholaas Rickert, Hartebeestpoort, P.O. Rietfontein West.
Witwatersrand—Johannes Lodewijk Pretorius, Vierfontein Station, P.O. Kaalfontein Station.
Bronkhorstspruit—Jacobus van der Walt, Knoppiesfontein, P.O. Bapsfontein.
Elands River—Pieter Lafras Uys, Rietfontein, Elandsfontein Station.
Aapies River—Johannis Barend Wolmarans, Donkerhoek, P.O. van der Merwe Station.

RUSTENBURG :—

Hex River—Georg Heinrich Wilhelm Behrens, P.O. Bethanie.
Elands River—Roelof Jacobus Petrus van Tonder, Olievenkloof, P.O. Pella.
Highveld—Pieter Stephanus Steenekamp, P.O. Cyferbult.
Zwart Ruggens—Petrus Jacobus van der Walt, Witrand, P.O. Koster.

HEIDELBERG :—

Roodekoppen—Andries Jacobus Greyling, Roodewal, P.O. Greylingstad Station.
Highveld—Willem Francois Pretorius, Rietfontein, P.O. Devon Station.
Suikerboschrand—Johannes Stephanus Fourie, P.O. Heidelberg.
Klip River—William George Devenish, Witkoppies, Meyerton.

KRUGERSDORP :—

Krugersdorp—Nicholaas Jacobus Pretorius, jun., Hartebeesthoek, P.O. Scheerpoort.
Witwatersberg—Frederik Jacobus Potgieter, Nooitgedacht, P.O. Hekpoort.
West Rand—Christoffel Frederik Theodorus Hendrikz, Luipaardsvlei, P.O. Randfontein.

POTCHEFSTROOM :—

Upper Mooi River—Stephanus Gottfried Krugler, P.O. Frederikstad.
Gats Rand—Jacobus Francois van der Merwe, Leeuwkop, P.O. Kraalkop.
Vaal River—Nicholaas Marthinus Prinsloo, Rietpoort, P.O. Parys (*pro tem*).
Upper Schoonspruit—Daniel Johannes Ysel, Elandskuil, P.O. Ventersdorp.
Lower Schoonspruit—Pieter Jacobus Jooste, Box 5, Hartebeestfontein.

MARICO :—

Bushveld—Francois Johannes Diederik Furstenburg, Witpootje, Zeerust.
Klein Marico—Daniel Lourens Botha, Weltevreden, P.O. Zeerust.
Groot Marico—Lourens van Niekerk, Doornkraal, P.O. Wonderfontein.
Highveld—Willem Adriaan Lombaard, Rietspruit, P.O. Grootafdeeling.
Moloppo—Charles Pieter Marais, P.O. Ottoshoop.

LICHTENBURG :—

Zoutpan—Andries Petrus Visser, Leeuwpan, P.O. Barberspan.
Lower Harts River—Hendrik Cornelis Wilhelmus Vermaas, jun., Post Bag Doornpoort, P.O. Hartebeestfontein.
Upper Harts River—Gabriel Johannes Greeff, P.O. Manana.

BLOEMHOF :—

Schweizer Reneke—Louis Elwin Lauritz, Mussmann, P.O. Schweizer Reneke.
Christiana—Paul Johannes Maré, Grootplaats, P.O. Christiana.
Bloemhof—Pieter de la Rey Swartz, Vierfontein, P.O. Bloemhof.

WOLMARANSSTAD :—

Upper Ward—Wouter Cornelis Justinus Brink, Vlakfontein, P.O. Zandelingsfontein.
Lower Ward—Sarel Petrus du Toit, Wildebeestfontein, P.O. Leeuwdoorns.

WATERBERG :

Koedoesrand and Zoutpan—Johannes Phillippus van Staden, Zoutpan.
Zwagershoek—Christoffel Bernardus Swanepoel, Knoppiesfontein, Post Bag T. H. de Villiers, Hartebeestfontein.
Nylstroom—Hermanus Stephanus Lombard, Grootvlei, Box 21, Nylstroom.
Potgieters—Daniel Petrus van Rooyen, P.O. Potgietersrust.

GOVERNMENT NOTICE No. 1150 of 1907.

It is hereby notified for general information that His Excellency the Governor in Council has been pleased to approve of the following Regulations passed under the provisions of Section *five* of Ordinance No. 17 of 1902 and the cancellation of the Regulations published under Government Notice No. 32 of 1907 :—

1. No person shall import any cattle from the Colony of Natal, except cattle which having been imported for breeding purposes from oversea and having passed through Natal by rail direct have entered this Colony under special permit and subject to such conditions as the Minister of Agriculture may prescribe; and any person contravening this Regulation shall be liable on conviction to a fine not exceeding fifty pounds and in default of payment to imprisonment with or without hard labour for a period not exceeding six months.

2. Any cattle which may after the date of the promulgation of these Regulations have come into this Colony from the Colony of Natal, save such cattle as are expressly excepted from the prohibition contained in the preceding Regulation, and save such slaughter stock for which permits have at the date of such promulgation been issued, may be seized by any Resident Magistrate, Native Commissioner, Sub-Commissioner, Justice of the Peace, Police Officer or Constable, and detained and taken to a place of isolation, and the person so seizing and detaining such cattle shall immediately report all the circumstances to the Minister of Agriculture who may order any such cattle to be slaughtered or otherwise dealt with.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 17th October, 1907.

GOVERNMENT NOTICE No. 1163 OF 1907.

PLANT IMPORT REGULATIONS.

It is hereby notified for general information that His Excellency the Governor in Council, under the powers in him vested by Section *one* of Ordinance No. 16 of 1904 (The Diseases of Plants Prevention Ordinance, 1904), has been pleased to approve of the following Regulation for preventing the introduction and spread of insect pests and plant diseases in addition to the Regulations published under Government Notice No. 809 of 1907.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 17th October, 1907.

"For the purpose of preventing the introduction into this Colony of the plant disease known as 'Vine mildew' it shall not be lawful to import any consignment of vinegar, wine or brandy, bottled or casked in any area mentioned in paragraph 1 of the Regulations published under Government Notice 809 of 1907, unless the same is accompanied by a certificate of a Magistrate or a Justice of the Peace, having jurisdiction in such area, to the effect that the bottles or casks in which it is contained have been sterilized either by scalding with boiling water or properly washed with a formalin solution of not less than 5% (five per cent) strength."

GOVERNMENT NOTICE No. 1186 OF 1907.

It is hereby notified for general information that, in order to promote the breeding of pure-bred stock, the following prizes will be offered by the Department of Agriculture at Agricultural Shows held in the Transvaal during the ensuing season:—

(1) Gold Medal, value £4 4s., for best colt or filly, under three years of age, got by a stallion the property of, or purchased from, the Department of Agriculture.
(2) Gold Medal, value £4 4s., for best pair of steers (oxen) or best pair of heifers, under three years of age, got by a bull the property of, or purchased from, the Department of Agriculture.
(3) Gold Medal, value £2 2s., for best two sheep, under two years of age, got by a ram the property of, or purchased from, the Department of Agriculture.
(4) Gold Medal, value £2 2s., for best two pigs, under two years of age, got by a boar the property of, or purchased from, the Department of Agriculture.

Conditions of Award:—

(1) Exhibits must have been bred by the exhibitor, and each entry must be accompanied by a certificate giving the particulars of the sire and the dam, or dams, of the animals entered.
(2) Any animal or animals which have won these prizes once shall not be eligible to compete again for the same prize, except at the Show of the Witwatersrand Agricultural Society.
(3) Any dispute arising on any of these conditions shall be referred to the Director of Agriculture, and his decision shall be final.
(4) Judges are requested to place the second in order of merit, where there is competition.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 22nd October, 1907.

GOVERNMENT NOTICE No. 1220 OF 1907.

GAME PRESERVATION ORDINANCE, 1905.

It is hereby notified for general information that His Excellency the Governor in Council has been pleased, under Section 4 of the Game Preservation Ordinance, 1905, to approve of the amendment of the Regulations published under Government Notice No. 251 of the 1st March, 1906, as follows :—

I. By the deletion of Regulations Nos. 32, 33, 34, 35, 36 and 37, and the substitution therefor of the following :—

32. No person shall, upon Crown Land, capture the young of wild ostriches or take the eggs of ostriches unless he shall have first secured from the Minister of Lands a permit. Such permits shall distinctly state the number of young ostriches and eggs to be captured or taken. No permit shall be of force for more than six months from the date of issue thereof.

33. It shall not be lawful for the Minister of Lands to issue a permit under the preceding Regulation unless he is satisfied that the applicant for such permit requires the ostrich chicks or eggs for his own use in ostrich farming on the land of which he is the occupier, and that such applicant will report to him regarding the number of chicks or eggs captured or taken.

34. Any person contravening the provisions of Regulation 32 or the conditions of any permit issued thereunder, shall be liable, on conviction, to a fine not exceeding £25.

35. Any person who shall, except with the permission of the Minister of Lands first obtained, sell or otherwise dispose of for profit, any chick or egg captured or taken under the authority of a permit issued under Regulation 32 hereof, shall be liable, on conviction, to a fine not exceeding £25.

II. By the deletion of the words "Commissioner of Lands" in Schedule H, and by the substitution therefor of the words "Minister of Lands."

III. By the deletion of the words "a permit under Regulation 32, £3 0s. 0d.," in Schedule J, and the substitution therefor of the words "a permit under Regulation 32, Free."

E. H. L. GORGES,
Acting Assistant Colonial Secretary.

Colonial Secretary's Office,
Pretoria, 6th November, 1907.

GOVERNMENT NOTICE No. 1262 OF 1907.

It is hereby notified for general information that His Excellency the Governor in Council has been pleased to approve of the following Regulation passed under the provisions of Sub-Section (1) of Section *five* of Ordinance No. 17 of 1902, and the cancellation of the Regulation published under Government Notice No. 1124 of 1906 :—

"When any person shall be found removing or causing to be removed or to have removed or to have caused to be removed any cattle from an infected area to a place outside such area or from a place outside an infected area to a place within such area or from one place to another within an infected area without the permit or license for removal prescribed by any regulation for the time being in force or when any person shall refuse or fail to produce the license or permit to remove cattle required by any regulation for the time being in force or if any cattle be found straying and the ownership is not claimed within forty-eight hours then any Magistrate Native Commissioner or Sub-Commissioner Justice of the Peace Police Officer or Constable or any officer of the Department of Agriculture may seize and detain any such cattle and take the same to a place of isolation and shall thereupon report all the circumstances to the Minister of Agriculture who may order any cattle seized and detained as aforesaid to be slaughtered or otherwise dealt with in manner prescribed by him. If the same be slaughtered the carcase shall be dealt with in such manner as the Minister of Agriculture may determine."

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 15th November, 1907.

List of Stock sold by Public Auction at Experimental Farm, Potchefstroom, Saturday, 23rd November, 1907.

CATTLE.

Breed.	No. Sold. Imported.	No. Sold. Bred.	Highest Price. £ s. d.	Lowest Price. £ s. d.	Average Price. £ s. d.	Last Year's Average Price. £ s. d.	Total. £ s. d.
Shorthorn (Coates) Bull	1		—	—	42 0 0	49 7 0	42 0 0
Shorthorn (Coates) Bulls	..	3	97 13 0	60 18 0	80 17 0	40 3 3	242 11 0
Lincoln Red Shorthorn Bull ...		1	—	—	89 5 0	56 14 0	89 5 0
Ayrshire Bulls ...	—	4	50 8 0	40 19 0	46 9 3	49 1 9	185 17 0
Red Poll Bulls		3	58 16 0	50 8 0	54 12 0	-	163 16 0
Sussex Bulls ...		2	58 16 0	50 8 0	54 12 0	36 4 6	109 4 0
Hereford Bulls ...		4	53 11 0	49 7 0	49 17 6	39 18 0	199 10 0
Aberdeen-Angus Bull	—	1		—		—	45 3 0
Red Poll Cows ...		3	59 17 0	19 19 0	33 12 0		100 16 0
Red Poll Heifers ...		5	27 6 0	10 10 0	19 10 7		97 13 0
							£1,275 15 0

SHEEP AND GOATS.

Breed.	Imported.	Bred.	Highest Price. £ s. d.	Lowest Price. £ s. d.	Average Price. £ s. d.	Last Year's Average Price. £ s. d.	Total. £ s. d.
Suffolk Down Rams		7	21 0 0	13 13 0	17 3 6	14 14 8	120 4 6
Shropshire		3	17 17 0	15 15 0	16 9 0	14 5 7	49 7 0
" " "	5	--	13 13 0	5 5 0	8 3 9		40 19 0
" " Ewes	14	--	3 13 6	2 12 6	2 14 0		37 16 0
Angora Rams ...	9	--	6 6 0	1 4 0	5 2 8	—	46 4 0
							£294 10 6

PIGS.

Breed.	Imported.	Bred.	Highest Price. £ s. d.	Lowest Price. £ s. d.	Average Price. £ s. d.	Last Year's Average Price. £ s. d.	Total. £ s. d.
Berkshire (boars and sows)	--	28	6 6 0	1 11 6	3 9 4½	--	97 2 6
Large Black (boars and sows) ...	---	10	7 17 6	2 12 6	5 7 1	5 15 6	53 11 0
Large White Yorkshire (boars and sows)	..	23	6 6 0	1 16 6	3 7 4	4 3 6	77 8 6
Tamworth (boars and sows) ...	—	13	2 12 6	1 11 6	2 3 7	5 5 0	28 7 0
							£256 9 0

SUMMARY.

	Average Price. 1905.	Average Price. 1906.	Average Price. 1907.	Total.
CATTLE—	£ s. d.	£ s. d.	£ s. d.	£ s. d.
1 Bull (Imported)	40 13 9	45 13 6	42 0 0	42 0 0
18 Bulls (Bred on Farm) ...	35 7 7	42 11 6	57 10 4	1,035 6 0
3 Cows „ „	—	—	33 12 0	100 16 0
5 Heifers „ „	24 8 10	—	19 10 7	97 13 0
SHEEP, ETC.—				
10 Suffolk and Shropshire Rams (Bred on Farm)	9 16 0	14 12 5	16 19 2	169 11 6
5 Shropshire Rams (Imported)	—	—	8 3 9	40 19 0
14 Shropshire Ewes „ ...	—		2 14 0	37 16 0
9 Angora Rams	—		5 2 8	46 4 0
PIGS—				
74 Boars and Sows (Bred on Farm)	—	4 7 9	3 9 3½	256 9 0
POULTRY	—	—	—	39 0 6
				£1,865 15 0

LIST OF PURCHASERS.

WITH ADDRESSES.

Purchasers.	Stock Purchased.	Price.	Total.
		£ s. d.	£ s. d
African Farms, Ltd., P.O. Box 5036, Johannesburg	Shorthorn Bull, D.O.A. 1P.	42 0 0	
	Suffolk Down Ram, D.O.A. 67P.	13 13 0	
	Shropshire Down Ram, No. 4	7 7 0	
			63 0 0
Qr.-Mr.-Sergt. Batty, Potchefstroom	4 Fowls	1 15 0	
			1 15 0
J. Bezuidenhout, Schweizer Reneke	3 Fowls	1 10 0	
			1 10 0
J. Blair, Potchefstroom	L. Wht. Yorkshire Boar, D.O.A. 140P.	3 13 6	
			3 13 6
A. Boas, Potchefstroom	Berkshire Boar, D.O.A. 15P.	2 12 6	
	„ Sow, D.O.A. 26P.	2 12 6	
			5 5 0
A. Boshoff, Potchefstroom	Berkshire Boar, D.O.A. 19P.	1 11 6	
	„ Sow, D.O.A. 19P.	1 16 9	
	L. Wht. Yorkshire Sow, D.O.A. 155P.	1 16 9	
			5 5 0
A. Burton, Potchefstroom	L. Wht. Yorkshire Boar, D.O.A. 141P.	2 12 6	
	„ „ Sow, D.O.A. 159P.	2 12 6	
	„ „ „ D.O.A. 160P.	2 12 6	
			7 17 6
J. P. Cloete, Potchefstroom	Berkshire Boar, D.O.A. 12P.	4 14 6	
	„ Sow, D.O.A. 17P.	4 14 6	
	„ „ D.O.A. 20P.	2 12 6	
			12 1 6
H. V. Cruess, Potchefstroom	L. Wht. Yorkshire Sow, D.O.A. 147P.	3 13 6	
			3 13 6

LIST OF PURCHASERS.—(*Continued.*)

Purchasers.	Stock Purchased.	Price.	Total.
		£ s. d.	£ s. d.
T. M. Cullinan, 109, Cullinan Bldgs., Johannesburg	Red Poll Cow, D.O.A. 16E.	19 19 0	
	" " D.O.A. 17E.	21 0 0	
	" " D.O.A. 18E.	59 17 0	
	L. Blk. Boar. D.O.A. 127P.	5 5 0	
	" Sow, D.O.A. 124P.	5 5 0	
			111 6 0
Justice Curlewis, Pretoria	Ayrshire Bull, D.O.A. 14P.	50 8 0	50 8 0
Dr. Dekma, Nylstroom	Red Poll Bull, D.O.A. 7P.	50 8 0	50 8 0
W. A. Dodds, P.O. Box 33, Johannesburg	Suffolk Down Ram, D.O.A. 71P.	18 18 0	18 18 0
T. Douglas, P.O. Box 1605, Johannesburg	Berkshire Boar, D.O.A. 22P.	2 2 0	
	" Sow, D.O.A. 22P.	2 2 0	
	2 Drakes	1 4 0	
	3 Fowls	1 2 0	
			6 10 0
Sir Geo. Farrar, Bedford Farm, Johannesburg	Lincoln Red Shorthorn Bull, D.O.A. 12P.	89 5 0	89 5 0
W. Gayer, Wolmaransstad	Berkshire Boar, D.O.A. 21P.	2 12 6	
	" Sow, D.O.A. 21P.	2 12 6	
			5 5 0
W. Gillespie, Rietpoort, Zandspruit	Berkshire Boar, D.O.A. 7P.	5 10 3	
	" Sow, D.O.A. 10P.	5 10 3	
			11 0 6
J. B. Gordon, Box 1?4, Pretoria	Berkshire Sow, D.O.A. 23P.	4 4 0	4 4 0
B. Enslin, Pretoria	Shorthorn Bull, D.O.A. 12P.	60 18 0	
	" " D.O.A. 14P.	97 13 0	
	Berkshire Boar, D.O.A. 11P.	5 15 6	
	" Sow, D.O.A. 16P.	5 15 6	
	L. Blk. Boar, D.O.A. 124P.	7 17 6	
	" " D.O.A. 125P.	6 11 3	
	" Sow, D.O.A. 128P.	7 17 6	
	" " D.O.A. 129P.	6 11 3	
	L. Wht. Yorkshire Boar, D.O.A. 145P.	3 3 0	
	" " " D.O.A. 138P.	4 4 0	
	" " Sow, D.O.A. 149P.	3 3 0	
	" " " D.O.A. 150P.	3 3 0	
	Tamworth Boar, D.O.A. 141P.	2 12 6	
	" " D.O.A. 142P.	1 11 6	
	" Sow, D.O.A. 133P.	2 12 6	
			219 9 0
E. W. Griffiths, De Wildt Siding, Pretoria	Tamworth Boar, D.O.A. 140P.	2 12 6	
	" Sow, D.O.A. 132P.	2 12 6	
			5 5 0
J. G. Gubbins, Ottoshoop	L. Wht. Yorkshire Boar, D.O.A. 146P.	3 13 6	
	" " Sow, D.O.A. 151P.	3 13 6	
	" " " D.O.A. 152P.	3 13 6	
	" " " D.O.A. 148P.	3 13 6	
	3 Turkeys	4 14 6	
	3 Ducks	1 0 0	
			20 8 6

LIST OF PURCHASERS.—(*Continued.*)

Purchasers.	Stock Purchased.	Price.	Total.
		£ s. d.	£ s. d.
J. L. v. Heerden, Middelburg	L. Blk. Boar, D.O.A. 130P.	4 4 0	
	„ Sow, D.O.A. 126P.	4 4 0	
			8 8 0
P. Hugo, Potchefstroom	Angora Ram, No. 5	4 4 0	
			4 4 0
C. Johnson, Ventersdorp	L. Wht. Yorkshire Boar, D.O.A. 141P.	1 16 6	
			1 16 6
F. W. Konig, Wolmaransstad	3 Fowls	4 4 0	
			4 4 0
S. Marks, Box 379, Pretoria	Red Poll Bull, D.O.A. 7E.	58 16 0	
	Sussex Bull, D.O.A. 12P.	58 16 0	
	Red Poll Heifer, D.O.A. 22P.	27 6 0	
	„ „ D.O.A. 19E.	26 5 0	
	Suffolk Down Ram, D.O.A. 61P.	18 18 0	
	„ „ „ D.O.A. 62P.	15 15 0	
	„ „ „ D.O.A. 63P.	15 15 0	
	8 Shropshire Ewes	21 0 0	
			242 11 0
W. A. McLaren, Box 1209, Johannesburg	Sussex Bull, D.O.A. 11P.	50 8 0	
			50 8 0
J. McLeod, Potchefstroom	1 Fowl	0 10 0	
			0 10 0
T. McLetchie, Schweizer Reneke	Angora Ram, No. 7	5 15 6	
	Fowls	1 1 0	
			6 16 6
The Hon. J. E. v. d. Merwe, Potchefstroom	3 Fowls	1 12 0	
	3 „	1 11 0	
			3 3 0
C. Meyer, Carolina	Angora Ram, No. 2	5 5 0	
	„ „ No. 9	5 5 0	
			10 10 0
A. O. D. Mogg, Potchefstroom	L. Wht. Yorkshire Boar, D.O.A. 143P.	2 2 0	
	„ „ Sow, D.O.A. 156P.	2 2 0	
	„ „ „ D.O.A. 158P.	2 2 0	
	1 Fowl	0 8 0	
			6 14 0
G. G. Moody, Haaskraal, Potchefstroom	Shropshire Down Ram, No. 2	5 5 0	
	2 Shropshire Down Ewes, with Ram lambs	7 7 0	
			12 12 0
P. Mostert, Lydenburg	Shropshire Down Ram, No. 3	6 6 0	
	4 Shropshire Down Ewes, with lambs	9 9 0	
	Angora Ram, No. 4	4 14 6	
			20 9 6
H. D. Munro, Mine Office, Cleveland	Berkshire Boar, D.O.A. 8P.	4 4 0	
	L. Wht. Yorkshire Boar, D.O.A. 139P.	6 6 0	
			10 10 0
J. A. Neser, Box 22, Klerksdorp	Shropshire Down Ram, D.O.A. 55P.	17 17 0	
			17 17 0
J. C. v. Niekerk, Alma, Machadodorp	L. Blk. Boar, D.O.A. 128P.	3 3 0	
			3 3 0

LIST OF PURCHASERS.—(*Continued.*)

Purchasers.	Stock Purchased.	Price.	Total.
		£ s. d.	£ s. d.
G. L. v. Niekerk, Potchefstroom	4 Fowls	2 1 0	2 1 0
Norman & Boyce, Box 2531, Johannesburg	L. Blk. Boar, D.O.A. 129P.	2 12 6	
	L. Wht. Yorkshire Boar, D.O.A. 144P.	3 3 0	
	Tamworth Boar, D.O.A. 136P.	2 2 0	
	" " D.O.A. 137P.	2 2 0	
	" Sow, D.O.A. 134P.	2 2 0	
	" " D.O.A. 135P.	2 2 0	14 3 6
Norton & Co., Boksburg	Berkshire Boar, D.O.A. 10P.	3 13 6	3 13 6
P. Patch, Potchefstroom	5 Fowls	2 10 0	2 10 0
J. W. Phillips, Leper Asylum, Pretoria	Ayrshire Bull, D.O.A. 12P.	50 8 0	50 8 0
T. Pitt, Potchefstroom	1 Fowl	0 11 0	0 11 0
F. Ratsey, Harrisburg	Red Poll Bull, D.O.A. 6E.	54 12 0	54 12 0
W. J. Rawborne, Box 496, Pretoria	Tamworth Boar, D.O.A. 138P.	2 2 0	
	" Sow, D.O.A. 136P.	2 2 0	
	" " D.O.A. 137P.	2 2 0	6 6 0
Reynolds Bros., Val Station	Hereford Bull, D.O.A. 16P.	53 11 0	
	3 Fowls	1 7 0	54 18 0
G. Rocher, Potchefstroom	3 Ducks	1 7 0	1 7 0
D. Ross, P.O. Box 97, Rustenburg	Berkshire Boar, D.O.A. 20P.	2 2 0	2 2 0
J. Ross, Potchefstroom	3 Fowls	1 1 0	1 1 0
Mr. Rousseau, Potchefstroom	1 Tamworth Boar, D.O.A. 143P.	1 11 6	1 11 6
The Hon. J. Roy, Box 1937, Johannesburg	Berkshire Boar, D.O.A. 5P.	6 6 0	
	" Sow, D.O.A. 13P.	6 6 0	12 12 0
C. H. V. Ruxton, Wagendrift, Premier Mine	Aberdeen Angus Bull, D.O.A. 5P.	45 3 0	45 3 0

LIST OF PURCHASERS.—(*Continued.*)

Purchasers.	Stock Purchased.	Price.	Total.
		£ s. d.	£ s. d.
J. F. Salmon, Rustfontein, Greylingstad	L. Wht. Yorkshire Boar, D.O.A. 146P.	3 3 0	
	" " " D.O.A. 147P.	3 13 6	
	" " " D.O.A. 142P.	2 2 0	
	" " Sow, D.O.A. 153P.	3 13 6	
	" " " D.O.A. 154P.	3 13 6	
			16 5 6
W. Sanderson, Legogot Farm, Nelspruit	Hereford Bull, D.O.A. 15P.	49 7 0	49 7 0
Mrs. A. W. Sanderson, Box 4379	Berkshire Boar, D.O.A. 9P.	5 5 0	5 5 0
J. Smith, Val Station	Hereford Bull, D.O.A. 17P.	51 9 0	51 9 0
C. C. Swartz, Lydenburg	Hereford Bull, D.O.A. 7E.	45 3 0	
	Red Poll Heifer, D.O.A. 20E.	19 19 0	
	" " D.O.A. 21E.	13 13 0	
	" " D.O.A. 23E.	10 10 0	
	Shropshire Down Ram, D.O.A. 53P.	15 15 0	
	" " " D.O.A. 54P.	15 15 0	
	Angora Ram, No. 1	6 6 0	
	" " No. 6	4 14 6	
	" " No. 10	5 15 6	
	Berkshire Boar, D.O.A. 13P.	1 11 6	
	" Sow, D.O.A. 24P.	1 11 6	
	Ducks	1 7 0	
			142 1 0
Capt. Thompson, 75, Coetzee Street, Johannesburg	Ayrshire Bull, D.O.A. 17P.	40 19 0	
	Shropshire Down Ram, No. 1	13 13 0	
	" " " No. 5	8 8 0	
	Fowls	1 0 0	
			64 0 0
J. Vine, P.O., Bloemhof	Suffolk Down Ram, D.O.A. 72P.	16 5 6	
	" " " D.O.A. 73P.	21 0 0	
	Berkshire Boar, D.O.A. 17P.	3 3 0	
			40 8 6
J. H. Wassermann, Machadodorp	Angora Ram, No. 3	4 4 0	4 4 0
J. Welch, Potchefstroom	2 Geese	0 16 0	
	3 Ducks	3 11 0	
	4 Fowls	2 5 0	
			6 12 0
F. Whitehead, Box 2267, Johannesburg	Berkshire Boar, D.O.A. 14P.	2 2 0	
	" Sow, D.O.A. 25P.	2 2 0	
			4 4 0
A. E. Willey, Potchefstroom	1 Fowl	0 13 0	0 13 0
H. Wilson, Box 61, Bethal	Shorthorn Bull, D.O.A. 13P.	84 0 0	84 0 0
Witbank Colliery, Ltd., Witbank	Ayrshire Bull, D.O.A. 15P.	44 2 0	44 2 0
	TOTAL ...	...	£1,865 15 0

DISTRICT SUMMARY.

District.	Stock Purchased.							Value.
	Bulls.	Cows.	Rams.	Ewes.	Goats.	Pigs.	Poultry.	
Barberton	2	—	2	—	—	—	2	£113 7 0
Bethal	1	—	—	—	—	—	—	84 0 0
Bloemhof	—	—	2	—	1	1	6	48 15 0
Carolina	—	—	—	—	2	—	—	10 10 0
Heidelberg	1	3	—	—	—	7	—	177 19 6
Lydenburg	1	3	3	8	5	3	3	169 17 6
Marico	—	—	—	—	—	4	6	20 8 6
Middelburg	1	—	—	—	—	2	—	52 10 0
Potchefstroom (including Klerksdorp)	2	—	7	12	1	17	38	291 14 0
Pretoria	5	2	—	—	—	6	—	332 17 0
Rustenburg	—	—	—	—	—	1	—	2 2 0
Standerton	2	—	—	—	—	—	3	106 7 0
Wakkerstroom	—	—	—	—	—	2	—	11 0 6
Waterberg	1	—	—	—	—	2	—	63 0 0
Witwatersrand	1	—	1	—	—	14	5	152 9 0
Wolmaransstad	—	—	—	—	—	2	3	9 9 0
Zoutpansberg	2	—	—	—	—	13	—	219 9 0
	19	8	15	20	9	74	66	£1,865 15 0

* * * *

Standerton Stud Farm Sale (December 16th, 1907).

Following are the prices with names of purchasers :—

HORSES.

Yorkshire coaching stallion Movement, Mr. Percy Dyer, £95.
Yorkshire coaching mare Cora, with foal by Movement, Mr. F. Viljoen, £47 10s.
Yorkshire coaching mare Lady Favourite, Mr. F. Viljoen, £35.
Half-bred bay mare, 8 years, Mr. R. A. West, Johannesburg, £27 10s.
Half-bred bay mare 5 years, Mr. R. A. West, £20.
Half-bred bay mare, aged, Mr. R. A. West, £20.
Bay English mare, aged, Mr. R. A. West, £22 10s.
Chestnut North American mare, aged, Mr. R. A. West, £20.
Dark brown North American mare, aged, Mr. H. C. Hull, £30.
Black North American mare, aged, Mr. R. A. West, £27 10s.
Brown North American mare, aged, Mr. J. Butler, £22 10s.
Red roan English mare, aged, Mr. R. A. West, £22 10s.
Bay English mare, aged, Mr. F. G. Siddall, £17 10s.
Dun North American mare, aged, Mr. R. A. West, £25.
Grey Colonial mare, aged, Mr. W. Fleming, Potchefstroom, £15.
Bay English mare, aged, Mr. A. Newman, Standerton, £10.
Dark brown American mare, aged, and foal by Toredo, Mr. A. H. S. Baker, Balfour, £22 10s.
Dark brown North American mare, aged, and foal by Toredo, Mr. W. R. Thomas, £35.
Bay North American mare, aged, Mr. R. A. West, £32 10s.
Bay North American mare, aged, Mr. J. Butler, £30.
Black North American mare, aged, with foal, Mr. R. A. West, £30.
Black Colonial mare, aged, with foal, Mr. W. R. Thomas, £25.
Bay English mare, aged, with foal, Mr. C. Woods, Standerton, £25.
Bay Colonial mare, aged, Mr. E. J. Goodwin, Potchefstroom, £30.
Bay North American mare, with foal by Toredo, Mr. T. Everard, Carolina, £20.
Chestnut North American mare, aged, with foal by Toredo, Mr. T. Everard, £17 10s.
Bay North American mare, with foal, Mr. A. H. S. Baker, £15.
Bay English mare, with foal by Movement, Mr. E. Nagle, £15.

Dark brown gelding, 4 years, Mr. E. Nagle, £25.
Bay filly, 4 years, Mr. J. Thomas, Johannesburg, £25.
Brown gelding, 4 years, Mr. J. E. Bigwood, Standerton, £20.
Black gelding, 4 years, Mr. A. Kerslake, Val Station, £20.
Bay gelding, 4 years, Mr. T. Everard, £20.
Bay gelding, 4 years, Mr. W. R. Thomas, £27 10s.
Chestnut filly, 3 years, Mr. Fleming, £17 10s.
Bay gelding, 3 years, Mr. C. Howe, Johannesburg, £29.
Black gelding, 3 years, Mr. P. J. Viljoen, Standerton, £17 10s.
Brown gelding, 3 years, Mr. D. J. Erasmus, Standerton, £25.
Bay gelding, 3 years, Mr. W. R. Thomas, £22 10s.
Brown filly, 3 years, Mr. S. Cohen, Standerton, £15.
Bay gelding, 3 years, Mr. D. J. Erasmus, £25.
Bay filly, 3 years, Mr. Caleb Smith, Val Station, £20.
Bay filly, 3 years, Mr. Caleb Smith, £20.
Black gelding, 3 years, Mr. I. Gamsu, Nigel, £12 10s.
Bay filly, 3 years, Mr. F. Viljoen, £15.
Bay gelding (thoroughbred), 4 years, Mr. B. Runciman, Johannesburg, £52 10s.
Grey filly, 3 years, Mr. W. Viljoen, Standerton, £25.
Jack donkey, black, 6 years, Spanish (Catalonian) breed, General Louis Botha, £75.

CATTLE.

Hereford bull, calved August, 1904, Mr. J. Reid (Reid Bros.), Johannesburg, £35.
Hereford bull, calved January, 1906, Mr. G. Hayes, Pretoria, £30.
Hereford bull, calved March, 1906, Mr. S. Spencer, Johannesburg, £35.
Friesland heifer, bred by the late Mr. Van Rensburg, Mr. T. T. Donegan, £15.
Two Friesland heifers, Captain Madge, £17 10s. each.
Friesland heifer, Messrs. McCarthy and Cooke (Randklipfontein), £15.
Friesland heifer, Mr. R. Barron, Platrand, £17 10s.
Two Friesland heifers, Mr. C. Landau, £17 10s. each.
Four Friesland heifers, Mr. A. Mostert, Heidelberg, £15 (two), £12 10s. and £10.
Red Lincoln shorthorn bull, calved September, 1905, Mr. J. Wodehouse, Platrand, £67 10s.
Friesland bull, Wilhelm II., Mr. C. Landau, Standerton, £52 10s.
Friesland bull, Captain Madge, £40.
Friesland bull, African Farms, Ltd., £32 10s.
Friesland bull, Captain Madge, £30.
Friesland cow, bred by the late Mr. van Rensburg, Heidelberg, Mr. C. Lambert, Johannesburg, £17 10s.
Friesland heifer, imported, Mr. C. Landau, £20.

A number of red Texan cows were put up in lots. Six, with four calves, brought £13 each (Mr. H. C. Hull), six, with six calves, £13 each (Mr. H. C. Hull), six were sold at £10 each (Mr. Reid, Johannesburg), six at £12 each (Mr. Mostert), six at £11 each (Mr. Hull), and three at £15 each (Mr. Hull).

Six two-year-old heifers from Texan cows (sire unknown) sold for £10 10s. each, and five for £10 each.

A number of yearlings were put up, consisting of mixed heifers and oxen, from Texan cows by Coates shorthorn bull and Hereford bull. Nine of these went at £5 each, four at £4 10s. each, six at £7 each, and six at £7 10s. each.

TRANSVAAL METEOROLOGICAL DEPARTMENT.

OBSERVATIONS OF TEMPERATURES (FROM SELF-REGISTERING THERMOMETERS IN STEVENSON SCREENS).—AUGUST, 1907.

PLACE.	FOR THE MONTH.			HIGHEST.	LOWEST.
	Mean Max.	Mean Min.	Mean.		
	degs.	degs.	degs.	degs.	degs.
Bloemhof	73·5	34·3	53·9	83·0 on 30th	23·0 on 4th
Johannesburg—					
Observatory ...	66·4	45·9	56·2	75·8 „ 30th	34·1 „ 4th
Komati Poort	81·7	50·4	66·0	98·0 „ 29th	40·0 „ 1st & 3rd
Leydsdorp	78·5	54·1	66·3	92·0 „ 30th	45·0 „ 16th
Pretoria, Arcadia ...	75·1	38·1	56·6	85·3 „ 30th	27·8 „ 5th
Volksrust	68·1	32·2	50·2	77·4 „ 31st	22·0 „ 1st & 15th
Zeerust	76·7	35·7	56·2	87·0 „ 30th & 31st	27·3 „ 5th

The mean temperature for the month was two degrees higher than in August, 1906. Extreme temperatures were several degrees less. Taken altogether, August was a very genial mild month without frequent heavy winds.

RAINFALL RETURN FOR AUGUST, 1907.

A slight thunderstorm passed across the eastern districts of the Colony on the evening of August 31st, giving rise to some light rainfalls, but, with the exception of this and some very light showers in the Zoutpansberg, the month of August has been rainless.

The following amounts of rain have been recorded:

Barberton District ...	... Barberton	0·05 ins. on	1 day.
Lydenburg „ ...	... Belfast	0·03 „ „	1 „
Middelburg „ ...	... Middelburg	0·01 „ „	1 „
Swaziland „ ...	... Mbabane	0·01 „ „	1 „
Zoutpansberg „ ...	... Louis Trichardt	0·03 „ „	1 „

OBSERVATIONS OF TEMPERATURES (FROM SELF-REGISTERING THERMOMETERS IN STEVENSON SCREENS).—SEPTEMBER, 1907.

PLACE.	FOR THE MONTH.			HIGHEST.	LOWEST.
	Mean Max.	Mean Min.	Mean.		
	degs.	degs.	degs.	degs.	degs.
Bloemhof	76·0	47·0	61·5	86·0 on 7th	28·0 on 1st
Johannesburg—					
Joubert Park ...	69·7	46·7	58·2	79·3 „ 13th	37·6 „ 14th
Observatory ...	68·9	47·5	58·2	78·9 „ 13th	36·0 „ 14th
Pretoria, Arcadia ...	78·9	48·6	63·8	90·3 „ 13th	42·6 „ 23rd
Pietersburg	76·4	48·1	62·2	90·0 „ 13th & 14th	40·0 „ 1st & 24th
Standerton	73·4	39·8	56·6	85·0 „ 14th	30·0 „ 1st
Zeerust	78·3	48·6	63·4	89·0 „ 6th	38·3 „ 16th

September, 1907, has been a milder month than September, 1906, and has been much milder than the average September. Compared with September, 1906, mean temperatures were one to two degrees less, and maximum readings have also been moderate. Minimum readings have been two to four degrees higher.

Rainfall Return for September, 1907.

(Including Rainfall since 1st July last, and the corresponding figures for the previous season.)

Note.—The rainy season is measured from 1st July in one year to the 30th June in the next.

District.	Place.	Month. Sept., 1907. Ins.	Days.	Season. From 1st July, 1907. Ins.	Days.	Averages. September. Ins.	Days.	Averages. Season. Ins.	Days.
Barberton ...	Komati Poort	1·53	3	1·53	3	1·16	2	1·33	3
Bethal ...	Bethal	0·74	3	0·74	3	0·67	3	0·74	4
Bloemhof ...	Bloemhof	3·75	6	3·75	6	1·22	3	1·23	4
Carolina ...	Carolina	0·87	4	0·87	4	0·86	3	0·87	3
Ermelo ...	Ermelo	0·74	6	0·74	6	0·64	5	0·68	6
	De Hoop, Amsterdam ...	1·20	7	1·20	7	1·38	5	1·59	7
Heidelberg ...	Heidelberg	3·41	5	3·41	5	1·16	4	1·25	4
	Vereeniging	2·00	5	2·00	5	0·67	4	0·82	5
Lichtenburg ...	Lichtenburg	3·21	4	3·21	4	1·13	3	1·14	3
Lydenburg ...	Belfast	0·69	4	0·82	5	1·08	4	1·20	7
	Pilgrims Rest	1·07	7	1·12	9	0·64	5	0·86	10
Marico ...	Zeerust	1·38	3	1·38	3	0·61	2	0·68	3
Middelburg ...	Middelburg	0·58	4	0·58	4	0·67	3	0·69	4
Piet Retief ...	Piet Retief	1·48	7	1·48	7	1·48	5	1·65	8
Potchefstroom	Klerksdorp	1·50	5	1·50	5	0·70	3	0·76	4
	Potchefstroom	1·97	5	1·97	5	1·04	4	1·08	5
Pretoria ...	Arcadia, Pretoria ...	0·95	4	0·95	4	0·46	2	0·50	3
	Molderfontein	1·89	5	1·89	5	0·80	3	0·83	4
Rustenburg ...	Rustenburg	1·22	4	1·22	4	0·55	2	0·55	3
Standerton ...	Standerton	2·11	5	2·14	5	1·07	3	1·29	4
Swaziland ...	Mbabane	1·59	8	1·60	9	1·41	6	2·10	11
Wakkerstroom	Wakkerstroom	1·10	6	1·10	6	0·89	5	1·17	7
	Volksrust	1·52	7	1·52	7	0·81	4	0·98	6
Waterberg ...	Nylstroom	1·07	2	1·07	2	1·09	1	1·16	2
	Potgietersrust	0·62	2	0·62	2	0·68	1	0·76	1
Witwatersrand	Joubert Park, Jo'burg	2·79	5	2·79	5	0·92	3	0·95	4
	Govt. Observatory, ,,	3·02	5	3·02	5	0·97	3	1·00	4
	Krugersdorp	1·75	5	1·75	5	0·63	3	0·66	3
	Zuurbekom	2·18	5	2·18	5	0·65	2	0·67	3
Wolmaransstad	Wolmaransstad	2·28	4	2·28	4	0·84	2	0·84	3
Zoutpansberg	Pietersburg	0·50	2	0·50	2	0·54	1	0·70	2
	Louis Trichardt ...	0·37	4	0·51	7	0·96	3	1·39	7
	Leydsdorp	0·22	2	0·23	3	1·01	1	1·01	2

Summary.—Rainfall in September was deficient in the Zoutpansberg and was about normal in the Waterberg and Eastern Transvaal. Over the centre, W. and S.W. of the Colony, the rainfall has been much above the average, and is one of the best known for the time of the year.

Observations of Temperatures (from Self-registering Thermometers in Stevenson Screens).—October, 1907.

Place.	For the Month. Mean Max.	Mean Min.	Mean.	Highest.	Lowest.
	degs.	degs.	degs.	degs.	degs.
Barberton	76·9	56·1	66·5	94·5 on 22nd	41·6 on 6th
Bloemhof	80·0	51·1	65·6	90·0 „ 21st & 22nd	38·0 „ 19th
Johannesburg Observatory ...	71·8	50·3	61·0	84·8 „ 23rd	43·5 „ 7th
Pretoria, Arcadia ...	81·8	53·2	67·5	94·3 „ 23rd	41·8 „ 8th
Standerton	75·2	45·9	60·6	92·0 „ 23rd	32·0 „ 9th
Zeerust	85·3	54·2	68·8	95·8 „ 22nd	41·5 „ 9th

Temperatures during October were about normal. Compared with the corresponding month of last season, the maxima by day were somewhat higher.

Rainfall Return for October, 1907.

(Including Rainfall since 1st July last and the corresponding averages.)

Note.—The rainy season is measured from 1st July in one year to the 30th June in the next.

District.	Place.	Month. Oct., 1907. Ins.	Days.	Season. 1907-8. Ins.	Days.	Averages. October. Ins.	Days.	Season. Ins.	Days.
Barberton ...	Barberton	2·41	10	2·67	14	2·28	8	2·88	10
Bethal ...	Bethal	3·66	8	4·10	11	2·07	6	2·87	11
Bloemhof ...	Bloemhof	1·00	12	4·75	18	0·92	3	1·31	6
	Christiana	1·05	6	2·53	10	0·48	4	0·65	6
Carolina ...	Carolina	5·57	12	7·07	15	1·92	4	2·79	6
Ermelo ...	Ermelo	5·47	13	6·16	19	2·68	9	3·37	15
Heidelberg ...	Heidelberg	2·94	13	6·36	19	1·45	6	1·98	10
	Vereeniging	1·90	11	3·90	16	1·52	8	2·03	13
Lichtenburg	Lichtenburg	0·30	5	3·51	9	1·08	6	1·45	8
Lydenburg ...	Belfast	4·15	13	4·97	18	1·91	11	3·23	18
	Pilgrims Rest	3·25	13	4·37	22	2·27	9	3·04	20
Marico ...	Zeerust	0·16	5	1·56	8	1·83	7	2·29	10
Middelburg ...	Middelburg	3·00	10	3·88	13	2·40	8	3·13	12
Potchefstroom	Potchefstroom	1·56	9	3·53	14	1·23	6	2·02	11
	Klerksdorp	1·47	11	2·97	16	0·99	7	1·51	11
Pretoria ...	Arcadia, Pretoria ...	3·53	11	4·48	15	1·67	6	2·15	8
	Modderfontein	2·17	10	4·07	16	1·52	7	1·99	11
Rustenburg ...	Rustenburg	4·14	9	5·30	11	1·69	8	1·91	10
Standerton ...	Standerton	3·41	15	5·43	20	1·67	6	2·43	11
Swaziland ...	Mbabane	7·06	17	8·66	26	3·07	11	5·67	24
Wakkerstroom	Volksrust	3·75	17	5·27	24	1·77	8	2·56	14
	Wakkerstroom	3·75	12	4·85	18	1·68	6	2·88	14
Waterberg ...	Nylstroom	2·12	6	3·19	8	1·87	5	3·05	6
	Potgietersrust	1·17	5	1·79	7	1·53	6	2·40	7
Witwatersrand	Zuurbekom ...	3·57	11	5·75	16	1·51	7	2·92	14
	Govt. Observatory, J'burg	2·38	11	5·40	16	2·20	7	2·52	11
	Joubert Park, „	2·56	12	5·35	17	2·23	6	2·71	10
Wolmaransstad	Wolmaransstad	0·86	8	3·14	12	1·10	5	1·49	7
Zoutpansberg	Pietersburg	0·83	3	1·33	5	1·80	5	2·57	3
	Leydsdorp	1·27	7	—	—	—	—	—	—

Summary.—Over the northern districts and the western border rainfall was very deficient during October. The central districts of the Colony had a rainfall up to average, whilst the average was exceeded along the eastern districts. The rains came in two groups, one at the beginning of the month, the other at the end. The three intervening weeks of the month were rainless or nearly so. The season's rainfall (July—October) is generally above average; Marico and Zoutpansberg being the exceptions.

OBSERVATIONS OF TEMPERATURES (FROM SELF-REGISTERING THERMOMETERS IN STEVENSON SCREENS).—NOVEMBER, 1907.

PLACE.	FOR THE MONTH. Mean Max.	Mean Min.	Mean.	HIGHEST.	LOWEST.
	degs.	degs.	degs.	degs.	degs.
Barberton	77·4	59·4	68·4	95·2 on 10th	49·5 on 2nd
Bloemhof	84·1	52·7	68·4	94·0 „ 12th	42·0 „ 7th
Johannesburg—					
Joubert Park ...	74·5	52·9	63·7	81·0 „ 13th	48·0 „ 8th
Observatory ...	72·7	52·7	62·7	80·2 „ 13th	46·0 „ 8th
Pretoria, Arcadia ...	82·0	55·0	68·5	90·0 „ 10th & 13th	47·7 „ 11th
Volksrust	72·6	49·1	60·8	83·2 „ 14th	41·0 „ 7th
Zeerust	85·8	56·3	71·0	93·9 „ 5th & 10th	41·8 „ 8th

Temperatures have been remarkably even, with an absence of extremes. The means are normal for the month.

RAINFALL RETURN FOR NOVEMBER, 1907.

(Including Rainfall since 1st July last and the corresponding averages.)

NOTE.—The rainy season is measured from 1st July in one year to the 30th June in the next.

DISTRICT.	PLACE.	MONTH. Nov., 1907. Ins.	Days.	SEASON. From 1st July, 1907. Ins.	Days.	AVERAGES. November. Ins.	Days.	Season. Ins.	Days.
Barberton ...	Barberton	4·35	17	7·02	31	5·01	11	7·75	19
	Komati Poort	3·09	11	4·27	20	2·69	10	6·16	21
Bethal ...	Bethal	4·67	15	10·97	31	5·08	13	7·91	25
Bloemhof ...	Bloemhof	2·88	7	7·63	25	2·46	10	3·77	16
Carolina ...	Carolina	4·30	10	11·96	25	6·22	—	9·01	—
Ermelo ...	Ermelo	4·28	14	11·27	32	6·76	17	10·17	32
	De Hoop, Amsterdam ...	5·53	18	13·48	15	8·55	18	..	—
Heidelberg ...	Heidelberg	4·16	13	10·52	32	5·75	11	8·07	22
	Vereeniging	6·39	12	10·33	28	4·78	10	10·15	23
Lichtenburg ...	Lichtenburg	2·30	11	5·81	20	2·25	9	7·04	18
Lydenburg ...	Belfast	4·54	12	9·97	31	5·38	16	8·28	35
	Pilgrims Rest	5·29	17	9·76	40	3·95	14	7·00	34
Marico ...	Zeerust	5·48	8	7·04	16	3·90	9	6·24	19
Middelburg ...	Middelburg	6·06	14	9·94	27	6·00	14	9·13	26
Potchefstroom	Potchefstroom	3·54	10	7·07	24	3·71	9	5·74	20
	Klerksdorp	2·30	10	5·27	26	3·21	10	4·72	21
Pretoria ...	Govt. Buildings, Pretoria	6·46	12	10·30	27	4·37	12	6·02	20
	Arcadia. „	6·07	13	10·57	29	5·25	14	7·07	22
	Molderfontein	3·93	13	7·00	29	4·89	11	6·88	22
Rustenburg ...	Rustenburg	7·18	10	12·48	21	3·15	9	—	—
Standerton ...	Standerton	6·98	14	12·41	34	5·77	10	8·20	21
Swaziland ...	Mbabane	6·31	19	14·98	46	5·88	17	11·56	42
Wakkerstroom	Volksrust	6·79	12	12·06	36	5·06	14	10·00	32
	Wakkerstroom	3·96	7	8·81	25	5·90	14	8·52	28
Waterberg ...	Nylstroom	2·06	8	5·25	16	2·18	10	5·24	17
	Potgietersrust	3·34	9	5·13	16	3·14	7	5·54	14
Witwatersrand	Govt. Observatory, J'burg	4·61	15	10·01	31	5·30	11	7·50	23
	Joubert Park „	5·75	15	11·10	32	6·68	13	9·39	23
	Krugersdorp	4·06	14	7·81	29	4·42	10	6·33	22
	Zuurbekom	3·71	10	9·46	26	5·45	12	7·21	22
Wolmaransstad	Wolmaransstad	1·93	10	5·11	22	2·06	8	3·55	15
Zoutpansberg	Pietersburg	3·99	8	4·42	18	1·81	8	4·39	15
	Leydsdorp	4·76	12	6·26	22	—	—	—	—

SUMMARY.—The November rainfall was generally quite up to or over the average for this month. The season's rainfall is generally over the average. Excepting some parts of the Waterberg and Zoutpansberg, water is plentiful. The indications point to an excellent season in this regard. Cloudy weather, with an absence of drying winds, marked the latter portion of the month.

PRETORIA AND JOHANNESBURG PRODUCE MARKET PRICES.

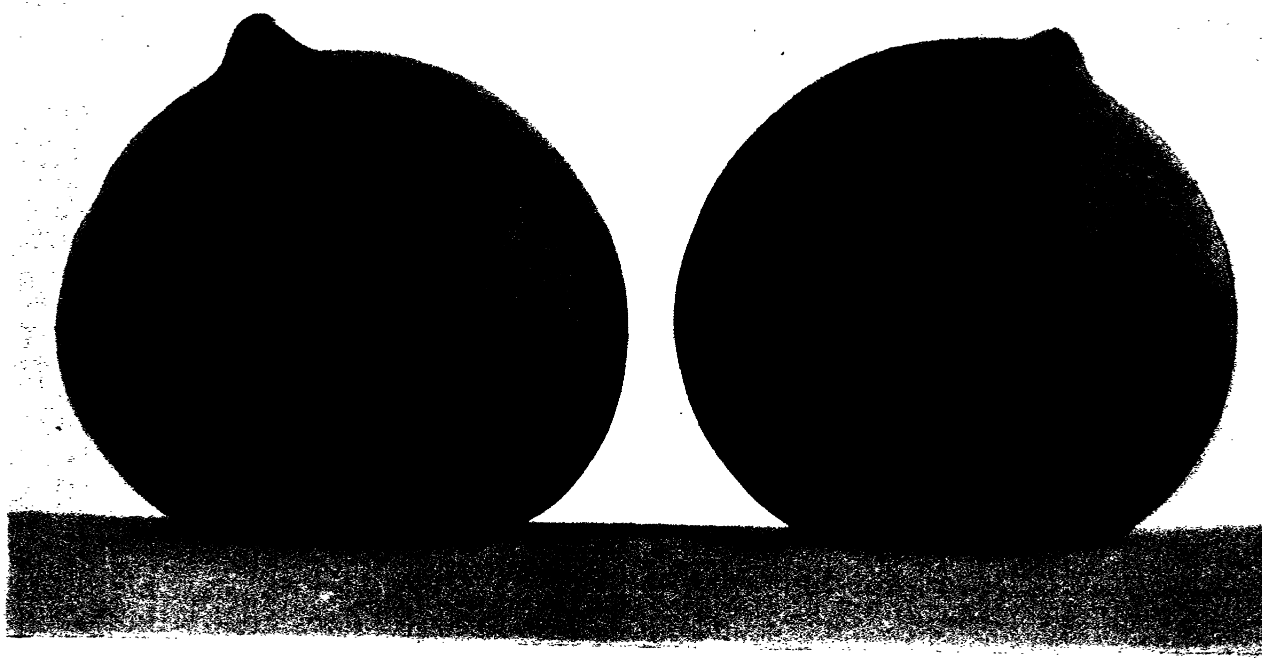
(Supplied by the Commercial Agency Co., Limited, Seed and Produce Merchants No. 116, Vermeulen Street, Telephone No. 165, Box 784, Pretoria; and by Messrs. Hubert Morisse & Co., Produce Merchants and Commission Agents, Loveday and Frederick Streets, Box 63, Johannesburg.)

PRETORIA.

Description.	*September*, 1907.		*October*, 1907.		*November*, 1907.	
	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
White Mealies	0 7 6	0 9 9	0 8 0	0 10 6	0 8 0	0 10 0
Yellow Mealies	0 8 0	0 9 6	0 8 0	0 9 9	0 8 0	0 10 0
Mixed Mealies	0 7 9	0 9 0	0 8 6	—	—	—
Forage, bundles (Best) ...	0 15 0	0 21 6	0 13 0	0 18 0	0 11 9	0 17 6
" " (Inferior)			0 7 3	0 15 0	0 7 6	0 10 6
Potatoes (Best)	0 10 6	0 18 6	0 10 6	0 17 6	0 11 0	0 15 0
" (Medium) ...	0 5 0	0 10 0	0 6 6	0 10 0	0 9 0	0 14 0
" (Inferior) ...	—	—	0 3 0	0 5 6	0 5 0	0 12 6
Hay, per bale	0 0 3	0 1 6	0 0 2	0 1 0	0 0 6	0 1 0
Chaff, per bale	—	—	0 5 0	0 8 9	0 3 0	—
" pressed	0 1 6	0 3 6	0 0 11	0 2 3	0 1 2	0 2 0
Kaffir Corn	0 11 0	0 15 0	0 11 9	0 15 6	—	—
Onions, red, per bag ...	0 10 0	0 15 0	0 10 3	0 22 6	0 9 6	—
Bran, per 100 lbs.	0 7 6	0 9 6	0 7 6	0 11 3	0 6 9	0 8 6
Barley, per 150 lbs. ...		—	0 7 6	0 10 0	0 9 0	0 10 6
Eggs, per doz. (Local) ...	0 0 10	0 1 3	0 1 0	0 1 11	0 1 0	0 1 6
" (Colonial) ...	0 0 9	0 1 1	0 0 10	0 1 7	0 1 0	0 1 3
Fowls, each	0 0 9	0 4 6	0 2 0	0 4 0	0 1 3	0 3 6
Ducks, "	—	0 3 3	0 2 11	0 3 6	—	—
Turkeys "	0 6 0	0 15 6	0 8 9	0 14 0	0 6 3	0 15 0
Tobacco, per roll	0 0 1	0 0 7	0 0 3	0 0 6	0 0 4	0 0 8
" cut, per lb. ...	—	—	0 0 1	0 0 4	0 0 4	—
Butter, per lb.	—	—	0 1 2	0 1 9	—	—
Oranges, per 100	0 0 9	0 5 9	—	—	—	—
Naartjes " "	0 0 8	0 4 0	—	—	—	—
Lemons " "	0 1 0	0 4 0	—	—	—	—
Wood, per load	0 15 0	0 60 0	0 15 0	0 55 0	0 17 6	0 55 0
S/B Meal, per 200 lbs. ...	—	—	—	—	0 29 0	0 31 6
Green Lucerne and Barley	0 0 4	0 1 6	0 0 9	0 1 3	0 0 9	0 1 3

JOHANNESBURG.

Description.	*September*, 1907.						*October*, 1907.						*November*, 1907.					
	Lowest.			Highest.			Lowest.			Highest.			Lowest.			Highest.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Barley, per 163 lbs. ...	0	7	9	0	11	0	0	7	6	0	11	0	0	7	6	0	11	6
Bran, per 100 lbs. (Colonial)	0	7	3	0	7	9	0	7	0	0	7	9	0	6	9	0	7	3
Chaff, best, per 100 lbs. ...	0	3	0	0	4	0	0	2	6	0	4	6	0	2	9	0	4	0
„ medium „ ...	0	2	0	0	3	0	0	1	6	0	3	0	0	1	6	0	2	0
Eggs, per doz. (Colonial) ...	0	0	10	0	1	1	0	0	9	0	1	0	0	1	2	0	1	6
Salt, per bag	0	7	0	0	7	6	0	6	0	0	7	3	0	5	9	0	6	0
Forage, (Transvaal) ...	0	6	0	0	7	0	0	3	6	0	7	0	0	3	6	0	6	9
„ (Col'nal) best per 100lbs	0	6	6	0	7	6	0	5	9	0	7	3	0	6	0	0	6	9
„ „ med. „	0	4	6	0	6	6	0	3	0	0	6	0	0	3	6	0	5	6
S. Meal, good	1	3	6	1	5	6	1	3	6	1	10	6	1	12	6	1	14	6
Rye	0	10	0	0	16	0	0	10	0	0	18	0	0	12	0	1	3	3
Wheat	0	17	9	1	0	6	0	18	9	1	3	3	1	1	0	1	4	6
Mealies, Hickory King Whites	0	7	3	0	8	0	0	7	6	0	9	0	0	9	0	0	9	9
„ (O.R.C.), Whites ...	0	7	0	0	7	9	0	7	0	0	8	6	0	8	6	0	8	9
„ Yellow	0	7	0	0	8	3	0	7	3	0	8	9	0	8	6	0	9	3
Kaffir Corn, per 203 lbs ...	0	11	0	0	12	3	0	11	0	0	12	9	0	11	6	0	14	0
Hay, sweet (Transvaal) ...	0	0	7	0	2	3	0	0	7	0	1	9	0	1	0	0	1	6
Lucerne, per 100 lbs. ...	0	5	0	0	6	3	0	5	0	0	6	0	0	4	3	0	6	3
Manna	0	1	6	0	5	0	0	2	0	0	5	0	0	2	9	0	4	6
Transvaal Hay	0	0	5	0	1	2	0	0	4	0	1	2	0	0	8	0	1	2
Oats, per 150 lbs.	0	6	6	0	13	0	0	8	0	0	12	6	0	6	9	0	11	9
Potatoes, best, per 153 lbs.	0	9	0	0	13	6	0	9	0	1	0	6	0	11	6	0	16	0
„ med. „ ...	0	5	0	0	8	6	0	5	0	0	10	6	0	8	0	0	12	6
„ inferior „ ...	0	3	0	0	5	6	0	3	0	0	6	6	0	4	0	0	8	6
Onions, good, per 120 lbs....	0	11	0	1	0	0	1	0	0	1	10	6	0	14	0	1	13	0
Pigs, live weight, per lb. ...	0	0	3	0	0	4	0	0	3	0	0	4	0	0	3	0	0	3½
Turkeys, cocks	0	7	6	0	12	6	0	7	6	0	15	6	0	8	6	0	15	6
„ hens	0	4	6	0	6	6	0	4	6	0	8	0	0	5	6	0	8	0
Fowls	0	1	9	0	3	6	0	1	9	0	3	8	0	1	9	0	3	8
Ducks	0	2	6	0	3	3	0	2	6	0	4	3	0	3	3	0	4	3
Geese	0	5	0	0	6	0	0	5	0	0	7	0	0	5	6	0	8	0
Pigeons	0	0	8	0	0	10	0	0	8	0	0	10	0	0	9	0	0	10
Bedding, per bale	0	0	6	0	1	0	0	0	6	0	1	0	0	0	6	0	1	0
Grass, per bale	0	1	0	0	1	2	0	1	0	0	1	2	0	1	0	0	1	2
Butter (O.R.C.), per lb. ...	0	1	0	0	1	2	0	1	0	0	1	2	0	1	0	0	1	6
Pumpkins, per 100 lbs. ...	0	3	0	0	4	0	0	3	0	0	4	0	6d. each			9d. each		
Beans, sound, per 200 lbs...	0	17	0	2	2	6	1	0	0	2	2	6	0	17	6	1	13	6



Yellow Peaches.

Sellar's Golden Clingstone.

[See Horticultural Section.

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ON THE ORDINANCES RELATING TO THE SPREAD OF DISEASE AMONGST STOCK AND THEIR ADMINISTRATION.

By H. Rose-Innes,

Resident Magistrate for the District of Pretoria.

SOMETHING like eighteen years ago, meeting a relative, son of a successful stock farmer in one of the midland districts of the Cape Colony, who had come to the Transvaal to start a career, I was asked by him what the prospects of stock farming were in the country. I informed him that so far as a two years' residence in the country and my observations, which were then of a casual and not altogether interested nature, entitled me to speak, I should say that the Transvaal would be a great stock-farming country were it not for the fact that all the Biblical plagues and a host of new ones ravaged every kind of stock. I have often since reflected that, although in my anxiety to emphasise the point I was betrayed into exaggeration of speech, the position, viewed in the light of later experience and with a new and real interest, appears to have been in substance and effect truthfully set forth by me on that occasion.

The pastoral industry, and more especially the cattle-raising branch of it, is of vital importance in the development of this Colony. Cattle-raising has in the past constituted the chief wealth and mainstay of the country. There is to-day great poverty amongst the agrarian population. It is not so apparent in the few districts where woolled sheep are grown and where the quickest recovery has been made from the effects of the late war. This poverty, however, existed in an acute form for some years. It was born out of the plague of rinderpest, which denuded the country of cattle in the year 1896. The greater part of the Transvaal to-day represents land lying waste and idle which, apart from the speculative element in the shape of minerals, can only be turned to best account by cattle ranching. In all new countries mining and ranching are the pioneers of progress, and prepare the land for other industries and closer settlement.

The pasturing of cattle on our waste lands is one of the requisite essentials in the "taming of the country."

Our mining development has reached that stage that its attendant fever of speculation has spent its force, for the time being at any rate. The result has been a heavy shrinkage in land values. These, apart from any revival of speculation and consequent temporary rise in values, can only be built up again by the exploitation of the land for agricultural

and pastoral pursuits. Farming is the backbone of every country, and forms the only sure and stable basis upon which land values can be built.

Owing to the absence of stock in the country after the war most of our farmers have had to resort to the tillage of the soil for the means of subsistence. This has resulted in a vastly increased production of the fruits of the soil, with the result that prices obtained to-day for agricultural produce have fallen to a level at which we are told it cannot be profitably raised.

A strong cry for protection has been raised throughout the country as a panacea for the existing evils which beset the farmer's path of progress. It would not be within the bounds of propriety for me to discuss this debatable and highly-contentious matter of politics.

It may, however, be stated that the following factors, apart from the question of protection, account for the present unsatisfactory condition of our local markets, upon which the farmers are at the present day almost entirely dependent for the disposal of their produce:—

(1) Their insufficiency and incapacity to satisfactorily absorb certain of our chief lines of production.

(2) The ill-regulated method of supply, resulting in violent fluctuations in prices, to the detriment of the farming community and in the creation of a middleman's paradise.

(3) The narrow basis of supply.

The first of these can only be eliminated by the creation of new industries and the attraction of population into the country or by the creation of an export trade: whilst the second will only disappear with the adoption and establishment of co-operative methods. But it is the last which chiefly concerns me in dealing with my present subject.

Our markets can be enormously strengthened and relieved of over-production in the lines indicated by broadening the present basis of supply. What we lack is the supply of live stock and their produce.

* * * *

Our old friend Gorgon Graham, in his "Letters of a Self-made Merchant to his Son," lays it down that the most profitable way of bringing produce to the market is on the hoof. Much of the produce which is to-day being sacrificed on the market could be profitably disposed of in growing and fattening stock—if we had the stock.

Whilst a great advance has been made in the cultivation of the soil, the raising of stock has been languishing owing to the diseases amongst cattle. The successful raising of stock will always be an impossibility until such time as the prevalent diseases are not only exterminatel but also prevented in the future from again obtaining a foothold in the country. The old stock farmers of the country will tell you that in the early days disease was practically unknown. The first visitant was lung sickness, and in later years rinderpest came. These diseases flourished as only things can flourish on virgin soil. The discovery in each case of an effective system of inoculation robbed these two diseases of most of their terrors. Whilst inoculation reduced the evil it did not exterminate it. Taking the case of lung sickness, it was always smouldering throughout the Colony, and came to be regarded by the stock farmer very much in the same light that we look upon the poor—something we are bound to have always with us.

The machinery for exterminating disease and making its recurrence impossible had yet to be devised when peace came in 1902.

With the advent of peace and the creation under Crown Colony Government of the Department of Agriculture, the matter of dealing with stock diseases was not lost sight of.

In addition to the old diseases of the country, the war had sown and spread broadcast over the land new diseases, imported with animals from oversea required for military purposes. The introduction immediately after the war by means of the importation of cattle through the East Coast littoral of a new and most dreaded sickness in the shape of Rhodesian redwater or East Coast fever, spurred the Department into action, and on the 22nd August, 1902, Ordinance No. 17 of 1902, to provide against the spread of diseases amongst stock appeared on the Statute Book of this Colony. The preamble of this Ordinance reads as follows:—*Whereas the disease among animals known as Rhodesian redwater (hereinafter described as the said disease) has broken out in the Transvaal: and whereas it is desirable to prevent the spread of the said disease.* Whilst this Ordinance and the Regulations thereunder were primarily created for our purpose of dealing with Rhodesian redwater, its provisions could, by proclamation, be applied and have since been applied to other diseases amongst stock. Upon this Ordinance is based all subsequent legislation for dealing with stock diseases. Ordinance No. 38 of 1904 provides for the compulsory fencing of infected and suspected farms. The system of fencing is a very necessary and almost indispensable adjunct to the administrative machinery created under Ordinance No. 17 of 1902.

After five and a half years' working of these Ordinances it may be said on their behalf that, humanly speaking, they will rid the country of all infectious diseases amongst stock. The question has now simply resolved itself into one of administration. We know that rinderpest and lung sickness have, as a result of the quarantine system and the control by the Government of all movements of cattle, disappeared; that Rhodesian redwater, whose tentacles are still fastened on considerable areas, may also be eradicated can confidently be asserted by pointing to the work which has been accomplished in the Pretoria District. I therefore propose to give a brief history of the disease and how it was dealt with in this district, not so much with the desire to adorn a tale as to point the moral and to illustrate such of my views and opinions on the subject as will hereafter be set forth.

* * * *

The disease was in the first instance brought to the Pretoria District in November, 1902, by a herd of cattle which came from Portuguese Territory, and the district received a second dose of infection in March, 1903, from a herd of cattle railed up from Barberton. As a result the Pretoria District became one of the most heavily infected, reaching a maximum of eighty-two farms and other places put under quarantine, including the town and town lands of Pretoria. Immediately the disease showed itself, the quarantine of infected farms was enforced. In June, 1903, the special regulations dealing with the disease were published. These regulations were at once stringently enforced. Their object was to control the movement of cattle. What is known as the permit system came into operation. No cattle were allowed to move from any farm except by license from the Department of Agriculture, either direct or through the Resident Magistrate according to circumstances, in regard to which instructions varied from time to time.

From the outset the bulk of the farmers in the district questioned the nature of this disease owing to the peculiar and varied symptoms

shown by it, resembling as they do in different cases those of rinderpest, lung sickness, heartwater, gall sickness, and ordinary redwater. They claimed that the disease dealt with by the authorities as Rhodesian redwater belonged to the category of *oude land ziekten.* The difficulties of the situation were intensified by the fact that the authorities were dealing with a people who had just passed under the sway of a new Government, between whom but little mutual confidence and understanding had been established. A feeling of suspicion sprang into existence under which the motives of the Government were brought into question. In the face of all these the enforcement of the regulations inflicted untold hardship. The chief and almost only means of transport possessed by the farmers were cattle. Those on quarantined farms could not move their cattle, and those on clean farms, whose market was in Pretoria, were in no better plight, as they could not move their cattle to the market. Remedial measures had to be established in the shape of donkey transport, organised and equipped by the Government.

With characteristic law-abidingness the farmers conformed to the law. I am only paying a just and deserved tribute by saying that in no single instance was there a breach of the Regulations committed with the object of showing defiance of the law.

It soon became apparent, however, that the feeling of tension created by the enforcement of the permit system was reaching a breaking point, and that in order to continue the carrying out of the Regulations it would be necessary to secure the co-operation of the farmers themselves by demonstrating to them the real nature of the disease, and thereby creating a proper appreciation of the methods employed to prevent its spread. In October, 1903, meetings were convened at three centres in the infected portion of the district, at which Dr. Theiler lectured to the farmers on the nature of the disease. Whilst Dr. Theiler, who had assisted during the Republican régime in dealing with rinderpest, and was therefore well known and respected by his audiences, was given a most attentive hearing in every case, it cannot be said that his words carried conviction to the minds of his hearers.

* * * *

The Government had in the meantime very wisely established a system of Advisory Committees in each district to assist the Magistrate. In constituting the personnel of the Advisory Committee for the Pretoria District individuals were appointed on account of the stake and influence they had in the matter, irrespective of opinions held. The result soon showed that a hostile element was represented on the committee. The committee was, however, the only medium through which conviction could be carried to the community. As the result of a heated debate, at a meeting of the committee held in January, 1904, in which the then principal veterinary surgeon, Mr. Stewart Stockman, and Dr. Theiler took part, a test calculated to afford ocular demonstration was decided upon and arranged under conditions accepted by both sides.

General Erasmus, one of the members of the committee, and also the largest cattle-breeder in the district, placed two oxen at the disposal of the Agricultural Department for the purposes of test. Under the joint supervision of the Department and the committee these oxen were infected with ticks. One died from the effects of the disease on the 17th March, 1904, and the other, already in a state of collapse, was, by mutual consent, destroyed on the 22nd March, 1904. The post-mortems held on these animals under this joint supervision carried conviction not only with all the members of the committee but with the farmers of the district and the

country at large. From that time the co-operation and support of the farmers were assured, and no fear as to the ultimate effect of the measures enforced was ever entertained by the local authorities.

As a result—notwithstanding the fact that great facilities were afforded in obtaining permits by entrusting their issue so far as *within* district movements were concerned to members of the Advisory Committees in the various wards—the Pretoria District to-day stands freed from the disease.

Not only this, but the farming population in the district are now firmly wedded to the permit system until such time as all danger has been removed.

I may here remark that but for the firm and unflinching attitude maintained by the central administration in the face of a well-nigh overwhelming opposition the result attained would never have been achieved.

Speaking from the experience gained in a strenuous strife lasting over five years, I feel confident that the present machinery provided by law is capable of exterminating Rhodesian redwater right throughout the country. What has been accomplished in the Pretoria District cannot be impossible of achievement in any other. And what has been done in regard to cattle diseases can also be done in regard to those amongst other stock.

In the administration of the law the following essentials are, in my opinion, necessary to ensure success:—

(1) That the supreme authority should in all matters remain with the central administration.

(2) That the central administration should be imbued with courage and tenacity of purpose in the administration of the law.

(3) That sympathy, mutual understanding and co-operation should be maintained between the authorities and the farming community.

(4) That the local administration should be kept in complete touch with the central administration and entrusted with as much responsibility as is compatible with absolute safety. The former again should subordinate its personal views and strictly carry out the instructions of the latter.

* * * *

The task which lies before the Government is still a stupendous one, the proper carrying out of which will call for the greatest patience and tactful dealing on the part of the authorities, and involve the farming community concerned in continued sacrifice.

Without sacrifice in this, as in all other matters of great achievement, nothing can be done.

The greatest difficulty is in dealing with native cattle. My experience of the natives in this district has been a singularly fortunate one, which is doubtless attributable to the close touch the Sub-Native Commissioners have kept with the natives over this matter.

The native problem in the Pretoria District is, however, not so complicated as in the larger native areas, such as in the Zoutpansberg and Lydenburg Districts. The draconian measures recently adopted providing for the branding of cattle and destroying without compensation those forming the subject of offence against the Permit Regulations seem to me the only possible means of stamping out the disease in the large native areas.

In writing these few notes for the columns of the *Transvaal Agricultural Journal*, I have presented the experience and point of view entirely of the lay official, whose privilege it is to assist the Government in the administration of law.

In conclusion, I would like to point out that the stamping out of disease is one achievement, and to prevent the recurrence thereof or the intrusion of new diseases is another. For the latter object vigilance—unceasing vigilance—is the price to be paid, not only now, but for all time.

COMPARATIVE RETURN OF OUTBREAKS OF CONTAGIOUS DISEASE IN EXISTENCE ON DECEMBER 31st OF EACH YEAR FOR THE PAST FOUR YEARS, SHOWING PROGRESS IN CONTROL OF STOCK DISEASES IN THE TRANSVAAL.

	Year.	Barberton.	Ermelo.	Heidelberg.	Krug'rsdorp.	Licht'nburg.	Lydenburg.	Marico.	Middelburg.	Piet Retief.	Potchefstroom.	Pretoria.	Rustenburg.	Standerton.	Wakk'rstroom.	Waterberg.	Wolmaransstad.	Witwatersrand.	Zoutpansberg.
Lung Sickness.	1904	—	2	—	9	—	—	1	2	—	5	—	7	3	—	1	6	—	—
	1905	—	2	—	—	—	—	1	—	—	—	—	—	—	—	—	1	—	—
	1906	—	2	—	—	—	—	2	—	—	—	—	—	—	—	—	1	—	—
	1907	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—
East Coast Fever.	1904	(a)	12	—	—	—	(b)	11	34	48	—	68	43	—	4	43	—	—	105
	1905	(a)	10	2	—	—	(b)	9	39	70	—	27	55	—	—	53	—	10	152
	1906	(a)	13	—	—	—	12	2	40	73	—	8	51	—	—	28	—	—	199
	1907	13	9	—	—	—	14	1	25	74	—	3	21	—	—	31	—	—	(c)259
Scab.	1904	—	92	1	7	3	11	8	9	2	13	12	1	18	18	11	37	—	2
	1905	—	65	24	2	1	5	5	6	4	16	7	8	35	40	12	42	3	8
	1906	—	143	27	11	10	9	11	13	14	33	27	11	98	78	11	37	6	51
	1907	3	143	49	14	18	14	40	40	31	55	111	16	90	72	20	58	7	126
Glanders.	1904	—	2	—	1	—	—	—	—	—	—	—	1	1	—	—	—	—	—
	1905	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1	—
	1906	—	—	1	—	—	—	—	1	—	—	2	—	9	1	—	—	12	—
	1907	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—
Mange.	1904	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	1905	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	1906	—	4	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	1907	—	3	—	1	—	1	—	—	—	—	—	1	—	1	—	—	1	—
Ulcerative Lymphangitis.	1904	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	1905	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	2	—
	1906	—	1	—	—	—	3	—	1	—	1	2	—	—	—	1	—	3	—
	1907	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	—	1	—
Swine Fever.	1904	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	1905	—	—	—	—	—	—	—	1	—	1	1	2	—	—	—	—	—	—
	1906	—	—	—	—	—	—	—	—	—	—	—	1	2	—	—	—	6	2
	1907	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

(a and b) No record kept as these Districts were each looked upon as one infected area.
(c) 146 farms were taken out of quarantine in the Zoutpansberg District in January, 1908.

[Compiled by R. H. WILLIAMS.

THE PRINCIPLES OF WOOL CLASSING.

By Vincent Bossley,
General Manager, Ermelo Stud Sheep Farm.

In this article the main principles of classing Merino wool will be treated from a practical point of view. At the outset it may be said that no uniform method for classing wool can be definitely laid down, as the difference in breed, locality, and climate causes a material change in the character of the wool. There is, however, one general rule that can be safely laid down for all classers to follow. This, briefly stated, consists in making as few sorts as possible consistent with practical scientific classing. Buyers do not like small lots, since these take just as long to value as large ones, and, if purchased, only partially fill the requirements of the large buyer, who probably wants hundreds of bales of an even class of wool, and is often quite ready to give a good price for them.

To realise the best prices a large clip must be classed with expert skill by someone with a knowledge of the needs of the buyers. Moreover, it is most important that a clear distinction should be made between each lot. The system of classing which is generally applied in South Australia, New South Wales, Queensland, and Tasmania has been highly commended by Local, Foreign, and English buyers, woolbrokers, etc. This classification is as follows:—

(1) Classing according to length and strength of the staple.

(2) Classing according to the condition of the wool, *i.e.*, the percentage of yolk and grease, and the amount of earth, sand, seeds, burrs, etc., in the fleece.

(3) Classing according to the colour and general characteristics of the wool.

Broadly speaking, fineness or coarseness of fibre is not a very important factor when classing Merino wool. In fact, as a rule, there is not sufficient difference in this respect to justify the clip from an ordinary Merino flock being treated on these lines. But there are a few exceptions, which will be dealt with later on.

Where culling is practised it seldom happens that a difference of many *counts* can be found in the degree of fineness of wool taken from a sheep of a like sex, age, and breeding, more especially if the wool has been grown under similar conditions; that is to say, if the sheep have been kept together on the same country. Indeed, Merino wool classed on the principle of coarseness and fineness seldom gives satisfaction; the distinction in the main not being sufficient to cause additional competition in the sale-room. To class on this principle would probably entail loss to the wool-grower by resulting in too many small lots, and at the same time would not assist the buyer in arriving at the proper valuation of the wool. Now the best classer is the man who can prepare the clip for market so that it can be lotted in the fewest number of bales.

The following detailed description of the work in connection with a well got up clip of Merino wool may be of some interest, as it is the system favoured by the buyers in most countries.

The shearer of the sheep must take the fleece off in one piece after first removing the belly wool. The boys employed in picking up the fleeces from the shearing floor and carrying them to the rolling tables must be made to take them up carefully all one way, starting from the britch with the flesh side up, and throw them carefully out on the table with the flesh side down.

After the fleece has been placed on the rolling table it is at once skirted by the man whose duty it is to roll the fleeces, *i.e.*, the roller, who should be instructed by the classer as to the amount of skirt to be taken off. Generally, the proper amount of skirt to take off is all the dirty, straggling, burry and seedy pieces from the edges of the fleece. Sometimes it is advisable to take off a deep skirt, while in other cases only a narrow one need be removed.

When the fleece has been properly skirted the neck is taken out (if deemed necessary by the classer) and the back, if sandy or mushy, is also taken right out. How much back and how much neck to be taken out is determined by the classer.

The fleece is next rolled. There are many ways to roll a fleece, but only one right way. After the skirting is accomplished about two-thirds of one side is thrown over, covering the whole of the back or weak part; the same side is thrown in a second time, thus exposing the whole of the back from neck to britch, and the underneath is the entire side of the best grown wool. The other edge on the opposite side of the table is next pulled over and the neck thrown in to make a secure hold when fastening the fleece. Commencing at the britch the fleece is rolled towards the shoulder and neck, the back thus being folded inside and the well grown side left exposed, as it should be when the bales are opened. Care must be taken not to unduly stretch the wool in rolling, and when near the neck a small piece of wool is drawn out, given a couple of twists to make a tassel, and placed cross-wise in a small hold made in the fleece binding it together. This does away with the use of string, which should never, under any conditions, be used in doing up fleece wool, or indeed wool of any description.

The ordinary way of rolling a fleece by throwing in the sides and then a piece of the neck and rolling from the britch to the neck exposes all the worst wool, including the wither wool, which is always faulty, even in the best of sheep. The backs and necks, if taken out, are thrown into their respective bins and pressed up in their separate bales. The backs require no further sorting, but it may happen that some of the necks require the matted collars skirting off, especially in grass-seedy country.

The skirtings are generally divided into two sorts besides the stained pieces, which must always be kept separate. The classes are :—

First pieces, consisting of all the best skirtings, that is the lightest, bulkiest, and wool most free from burrs, seeds, and dirt of any description.

Second pieces, comprising the remainder, minus the stains.

Bellies are picked up by boys and all stained wool carefully picked out. All stains should be dried in the sun on Hessian sheets before they are packed. The locks are carefully gone over, all large daggy pieces being kept out.

When shearing first begins a standard for the classing of the fleece wool must be fixed. This can only be done by waiting till a goodly number of the fleeces come before the classer, he can then determine how the wool should be divided up. Of course, the number of sorts that the fleeces are divided into depends on circumstances, the size of the flock, etc., but three sorts will generally be sufficient, namely:—AA., *First Combing*; BB., *Second Combing*, and a *Cast sort.* These classes apply to wool where the bulk of the clip is over two inches in length; should the bulk of the wool be under two inches in length, it should be branded First and Second Clothing when the wool is particularly fine in fibre. In small flocks it is well to simply brand First and Second fleece, and leave the determining of Combing or Clothing to the buying experts.

AA.—First Combing or First Fleece should be: A sound wool, consisting of all the lightest, brightest, and broadest stapled, viz., the most attractive looking fleeces.

BB.—Second Combing or Clothing should be: A sound wool, consisting of all sound fleeces not up to the standard of the AA. sort; namely, fleeces that are heavier in condition, *i.e.*, containing more yolk or earth, etc., and which are duller and less attractive looking than the Firsts.

The Cast Sort.—Composed of all the inferior fleeces, such as "extra heavy," "discoloured," "kempy," "extra coarse," "matted," or fleeces of two years' growth which would spoil any of the other sorts.

With regard to tender wool, that is, wool having no strength of fibre, mistakes are often made by placing such wool along with sound wool. This should not be done, as tender wool is neither fit for clothing nor for combing purposes, being a very faulty wool.

Always make the unsound fibred wool into a separate sort, and brand it simply fleece.

All black wool must be strictly kept by itself, and if in any quantity it is most advisable that grey, brown, and mixed colours be kept separate from the quite black. These wools are often valuable, being used by priests and monks for certain religious rites or ceremonies, when the cloth has to be pure and grey without the aid of any dye.

The reasons for classing as above laid down are:—

(1) The fleeces are skirted to free them from all inferior wool in order that buyers may have an opportunity of obtaining it without having to take the skirts. Certain manufactories do not take anything but the finest wool from each fleece, and therefore competition for this class of wool is much keener when freely skirted, besides the purchaser knows more exactly the value of the clean yield when scoured than if the rough pieces were mixed throughout the good.

(2) The main reason for taking out the necks is that the wool on this part of the sheep does not wash or scour to such a good colour as the rest. It is also generally lighter in condition.

(3) The removal of the backs from the fleeces is often necessary, owing to climatic and other conditions. The wool on this portion of

the sheep being the most exposed to the weather, becomes more open, mushy, and sometimes sandy, than on the other parts; and if left in the fleece would practically limit the competition to buyers of tender wool.

(4) The object of sorting the pieces is to give buyers the opportunity of getting the kind of wool they wish in one good, even line, without having to purchase wool they do not require.

Buyers may often require the bulkier large pieces classed as first, and not have any use for the shorter and heavier second pieces. Similarly, buyers of second pieces do not require the stained pieces, which can only be used for distinct and inferior descriptions of goods, for besides being lifeless they can only be dyed into the darker shades. Again, if the stained pieces are pressed with the clean a certain amount of stain is squeezed into the otherwise clean wool.

(5) "The dags" are kept out since, being mainly composed of dirt, it seldom pays to send them long distances to market.

(6) String should not be used to tie fleeces, for it entails extra trouble, firstly in tying, and secondly when the bales are opened out, every piece having to be removed. One piece missed means broken machinery and spoilt cloth. There have been constant complaints from various Chambers of Commerce, the highest authorities, on this subject, as no matter how careful the wool-sorter may be, twine will, sooner or later, find its way into his bales, and when scoured it is almost impossible to detect. After passing through and damaging the delicate machinery used in the manufactories, such wool will not take the dye, shows out, and the cloth is rejected.

* * * *

With regard to coarse and fine wool, it has been found that in certain localities, where a very fine wool is grown, and high prices often obtained on account of the superior fineness, too much care cannot be taken in keeping out any strong fibred fleeces, which would detract from the value of the finer ones. However, if the wool from hoggets, wethers, ewes, rams, and lambs be classed separately, the main lines already laid down must guide the classer.

In classing lambs' wool the system must differ, because lambs' wool, according to its nature, does not hang together like the wool from older sheep. The best way to pick it up from the shearing board is by means of two flat boards used as a scoop. The wool from one lamb only should be placed on the classing table at one time.

The number of sorts should not exceed two: *The Firsts* being the lightest, longest, and brightest wool; *The Seconds* comprise what is left from the firsts with the stains and dags picked out. As a rule, the stains and dags from the lambs may be placed with the locks from the grown sheep. Kempy wool so often found in lambs' fleeces should never be placed with the firsts; and, if possible, should be kept from the seconds also, but it is often not practicable to do so.

In conclusion, it is necessary to draw attention to the great damage done to well classed wools by careless pressing, the wool in many cases being broken and torn about in the most regardless manner. The wool should be carefully placed in the packs as evenly as possible, and not more than 320 lbs. in each pack. The packs should be shortened when necessary, and legibly branded with the owner's mark and number.

THE ADVANTAGE OF BRANDING.

By J. J. Pienaar,
Registrar of Brands.

BEFORE the promulgation of the Great Stock Brands Ordinance there was no law in force in this Colony to provide for the registration of a stock brand. A farmer was at liberty to make and use whatever brand he pleased without having it recorded. Most of these brands—about fifteen thousand in all—were composed of two or three letters, and as there are only twenty-six letters in the alphabet, it naturally followed that a very large number of these brands were identical. Consequently, the chances either of discovering a thief or of recovering stray and stolen stock were very remote.

Stock theft became very rife immediately after the cessation of the war, and it appeared that the difficulty in tracing stolen stock was due to the fact that they bore no owner's mark by which they could be identified. It was therefore thought advisable to introduce an Ordinance to provide for the allotment and registration of a distinctive brand to every stock-owner throughout the Colony. Before this Ordinance was laid before the Legislative Council the more important branding laws of the world were consulted, and I believe the Council was perfectly satisfied that the system of branding adopted is the best in existence.

At first objections were raised against the system established under the Ordinance, but these have gradually come to an end, and it is gratifying to be able to say that since then most of the objectors have obtained registered brands. In short, so far as I am aware, there is no system better than our own "Three-piece System."

There are people who argue that a Branding Law should permit an owner to register his initial letters. But, I would ask, "Is this practical?" Were we to introduce such legislation we should be doing what we know to be detrimental to the farming community. For instance, the initials of J. Potgieter, J. Prinsloo, and J. Pretorius are alike. Now, the objects of a Branding Law being to avoid the similarity of brands, and to register a separate and distinctive brand for every stock-owner throughout the land, only one of these owners would be able to register his initials. The other two will have to take other designs. The result of such a method would be that we should soon be saddled with such disfiguring brands as are seen on animals coming from Argentina, *e.g.*, flower-pots, frying-pans, gridirons, etc. These haphazard brands have undoubtedly done more to enhance, and even to legitimise, stock theft than any other cause. It is the duty of every well-wisher of our farmer to endeavour to eschew the use of such dangerous and out-of-date brands. What is easier for an owner of a frying-pan or gridiron brand than to "fake" any other brand in existence. If such a method were adopted the speculator of questionable repute would soon avail himself of a "flower-pot" or "frying-pan" branding iron so as to enrich himself with the stray stock of honest farmers. Furthermore, the owner of the brand "J.P. 1" could alter the brand "J.P." by adding to it the numeral 1. All these alterations would be most difficult to prove in a Court of Law.

Another objection to symbolic brands is that they cannot be readily indexed, and to look for an unknown symbol in a Brands Directory, containing some fifteen thousand brands, involves a little more time and labour than some may think.

The Three-piece System.

A matter of vital importance in framing a Branding Law is the brand. The brand must be simple, and should consist of known characters, so as to avoid any possible difficulty in finding it in the Brands Directory. As every brand under the Ordinance is composed of three characters, the system is known as "The Three-piece System." The three characters composing the brand are two letters of the alphabet (I and O excepted, which are exclusively used as numerals), and a numeral. The two letters and the numeral are of a plain and uniform pattern, and placed in an even and regular line. The first of the letters denotes the district in which the brand is to be used. For instance, a Bloemhof brand would be BA1, a Barberton brand NA1 (N being the district letter of Barberton), a Potchefstroom brand PA1, and a Pretoria brand AA1.

The advantages to be derived from the district letter are:—

(1) To reduce the cost of the administration of the Ordinance.. By the district letter each district is provided with a separate set of brands, so that the Magistrate of one district cannot possibly register a brand in use in another district, hence a considerable amount of administrative work is being done by the different Magistrates.

(2) To facilitate the detection of stray and stolen stock. When an animal strays or is taken by a thief from one district into another, it will be noticed at a glance that such an animal belongs to a holding in another district. By consulting the Brands Directory we know at once the name and the address of its owner.

(3) To prevent the spread of contagious diseases. By the aid of the district letter we are enabled to control the movements of stock much better. I may safely say that it is almost impossible for anyone to move stock bearing a registered brand from one district to another without being detected.

From enquiries received I should judge that there is some difference of opinion as to the necessity of the numeral. The numeral is undoubtedly the most important factor in the brand. It has already been remarked that the alphabet alone cannot supply a sufficient number of combinations for such a large Colony as the Transvaal; and in order to avoid the use of symbolic brands it is essential that one of the characters should be a numeral. In the Barberton district the combinations are as follows:—NA0—NA9; N0A—N9A; NB0—NB9; N0B—N9B, etc. From this it will be seen that the numeral is used to increase the number of combinations, and in going through the alphabet like this we get five hundred combinations for the district. When these are exhausted the last letter in the brand may be placed in a horizontal position, thus N1 ⊳, which may be described in a wire as N1 and a lazy A. Each such change supplies an additional five hundred brands.

By this uniform system of three-piece brands no one registered owner of a brand could alter another registered owner's brand by adding

to it one or more characters so as to make it represent his brand, for the Ordinance does not admit of the use of more than three characters in every brand. It also prohibits the obliteration of a brand or of any of its characters. The characters used in our system are so designed that they cannot be interchanged. The "faking" of a brand is therefore rendered practically impossible.

* * * *

Application.

Printed forms of application have been supplied to every Magistrate, who will distribute them amongst the Inspectors, S.A.C., Field Cornets, and other officials, from whom they may be had free of charge. When a form has been duly completed it should be forwarded to the Magistrate of the district in which the applicant intends to use the brand. In order to obviate unnecessary trouble and correspondence, applicants should satisfy themselves before despatching an application that it is correctly filled up, and in every instance accompanied by the registration fee of 5s. The Magistrate, on being satisfied that the application is in order, will register the brand applied for, and issue a certificate of registration as prescribed in Section 7 of the Ordinance.

Position for Brands.

Section 9 of the Brands Ordinance establishes an order of branding for first, second and subsequent brands. This has been done in order to enable one to determine who is the last owner of an animal, should the animal bear more than one registered brand.

The first position for imprinting a brand is on the near rump or thigh. The second on the off rump or thigh. The first brander is compelled by this section to imprint his brand on the first position. A subsequent brander may, where there is sufficient space, imprint his brand on the same position at a distance of not less than 1½ inches from and directly underneath the preceding brand or brands. Should position one be exhausted he is compelled to brand on the next succeeding position (off rump or thigh).

Quarterly Returns and Brands Directory.

At the end of each quarter, from returns sent in by the different Magistrates, a statement is published in the *Gazette* of all the brands registered up to the end of such quarter, along with the names and addresses of their respective owners. From these statements the Annual Brands Directory is compiled and published as soon as possible after the 31st of December each year. Copies of the Directory are forwarded gratis to Magistrates, officers of police, postmasters, poundmasters, and registered owners of brands.

Butchers, Auctioneers, and Poundmasters.

Every butcher, auctioneer, and poundmaster must keep a book at all times open to inspection by an inspector of brands or police officer. They are required by Section 22 of the Ordinance to enter therein the brand cut or imprinted on every animal slaughtered, dealt in, impounded, or sold by any one of them.

The Stock Theft Ordinance provides that when stock are slaughtered for sale, the hides must be retained for a period of five days, without any alteration, disfiguration or effacement of the brands or ear-marks imprinted thereon. Any Justice of the Peace, police officer, owner of cattle, or other person may, within this period, demand an inspection of such hides.

If an auctioneer or market master carelessly sells stock which shall be proved to have been stolen, he will be held personally responsible to the owner of such stock for the full value thereof.

Pounds have been established in our Colony for the purpose of collecting stray stock. This is not to deprive the owner of his stock, but to give him an opportunity of finding out, through the medium of the *Gazette*, the whereabouts of his animals. Yet a large number of animals are being sold out of pound, while their owners live among us. There is only one way by which a poundmaster can notify an owner direct, and that is by means of a registered brand. When stock bearing registered brands are impounded the poundmaster, by consulting his Brands Directory, knows at once the name and address of their owner, and he is compelled by Section 27 of the Ordinance to notify the owner either personally or by registered letter.

When stock are sold out of pound they are branded with a brand, of which the first character is a diamond, the second the district letter, and the third a numeral. One pound brand in the Barberton district may be ◊ N1 and another ◊ N2, etc.

Native Brands.

Section 16 of the Ordinance provides for the allotment of a brand to every native location throughout the Colony. The first character of every native location brand is a dagger, and of the remaining characters the one is the initial letter of the name of the location, and the other a numeral. Natives living on farms outside defined native locations may register brands with the district letter as first character. The characters composing these brands are of an italic pattern, so that they may readily be distinguished from brands allotted to Europeans, which are plain roman letters.

Such are the various advantages to be derived from a registered brand. King Hammurabi of Babylon, about 2250 B.C., under whose rule was promulgated the first Branding Law on record, which provided for a system of branding the slaves of each owner with an indelible mark, did not, like our Government, send out officers to explain the advantages of his law, but simply put to death every man who disobeyed his enlightened command. And so I feel sure that our farmers will manifest their appreciation of the less severe laws of the Transvaal Administration by having a brand registered without delay.

A REED CONSERVATORY.

BY E. J. BOURHILL.

IT is probably a long time before the settler from abroad realises the essential difference between a conservatory in South Africa and the glass-house of Northern Europe, filled with gorgeous bloom, oppressively hot and heavy with strange scents even in the midst of frost and cold. Both alike seek to preserve what is rare and precious, but while the greenhouse of the Old World is a shelter against icy winds and dark days, the South African conservatory shuts out the sun and seeks only moisture and cool air. Gorgeous bloom is readily obtained in the garden the whole year round by all who can command a supply of water, but fresh, cool, green plants need care and patience and cleverly contrived shelter.

Nothing answers the purpose so well as a conservatory of reeds. The first I ever saw was a tiny little house, perhaps 8 ft. square, in a Karroo garden. Rain fell in that district some dozen times a year; the garden was watered by irrigation, and a stone's throw beyond it the sun-baked veld began to be covered with scanty grey bush and great clumps of prickly pear. But the owner of the garden was determined to have ferns, and ferns there were. The reeds were closely set together to keep out the burning sun, and the ground was kept constantly moist. In the cool twilight thus created it was possible even to grow lilies of the valley. Asparagus fern flourished, and the hardier kinds of maiden-hair. Not much more was attempted, nor did we ever see anything approaching the magnificent display which seems possible in many districts of the Transvaal.

Here the rainy season tempers the summer heat, and in winter water is nearly always obtainable, so that with moderate care it is possible to have abundance of green fern all the year round. A reed conservatory has also another great merit. If well planned it will begin to reward the owner in less than six months, and to the town dweller of South Africa this is a great consideration.

The reed conservatory may be of any size from a mere pocket-handkerchief sufficient to hold some maiden-hair and a dozen begonias to the large rooms common in the Barberton district, banked up with delicate greenery and big enough to dine a dozen people or more. To that use they are often put, and nothing more charming can be imagined on a hot summer's day. It is from such a house that the following particulars were taken, but the experience gained in a large conservatory would apply equally well to a small one, as the materials employed are practically the same. (Plate 33.)

First, then, a light framework should be made, to which the reeds can be bound. Deal posts 2 in. by 4 in. will be found sufficiently strong for the purpose. They should be placed about 5 ft. apart, but it must be remembered that some strong wood, warranted to stand damp, must be used as foundation posts below the ground. Deal will do for all the framework above ground, including the roof, which should be pointed,

and not flat, to ensure drainage. Rough posts of any wood grown locally with the bark left on will look still better, but remember to have sound foundation posts.

The framework being made, the reeds can be bound to them with tarred string. This is better than wire, as the rain does not affect it. The horizontal bars to which the reeds are bound should be about 4 ft. apart, and securely nailed to the uprights. Reeds can be used for the roof; in fact, they are preferable to tin as admitting more light and air. Where, however, the conservatory is also used as a dining-room, it is advisable to roof over the portion under which the table stands with zinc, so as to avoid damp during the summer rains.

The reeds should not be placed too near one another. If they fit too well the conservatory will be too dark. Remember to thatch more closely on the side which faces the prevailing wind. Here, good shelter is required, as one strong gale will ruin the appearance of your ferns for weeks. As regards the reeds to be employed, the common vlei reeds found on the banks of most rivers in this country will answer the purpose, but the best—if you can get them—are the handsome Spanish reeds grown at many farms on the high veld. Thin poplar sticks will also do instead of reeds, and in some districts are more easily obtained. Skilled labour is not necessary; if you can ensure a strong framework, any Kaffir house-boy can fix the reeds in his spare time. The floor of your conservatory may be gravelled like a garden path or sprinkled with river sand.

* * * *

The house being finished, it is time to consider its fittings. Avoid tins as much as possible. Earthenware pots, of course, are expensive, but with a little ingenuity it is possible to make very pretty rustic pots and hanging baskets of wood. Bamboo sticks split in half and bound together with wire can be formed into a circle. Then fix a bottom to your pot of fine wire with a half-inch mesh. This is better then wood, and cheaper. Line the pot with moss or cocoanut fibre, and then fill with soil. Instead of bamboo, stout sticks about an inch in diameter can be used. For hanging baskets use any short pieces of wood. The shoots of a syringa answer the purpose admirably. First make the bottom of some four sticks tied together with wire. Then at two opposite corners wire eight bars of similar wood. When all are done twist the bars alternately, one to the right, the other to the left. You will now have four sides ready. Join the two remaining corners with wire, and the basket is finished. It should be lined with moss or fibre. A beautiful basket can also be made of wire-netting lined with moss; this can be round, and the fern roots may be placed at intervals all over it. In time you will have a lovely ball of maiden-hair suspended in the air.

Then, again, a pillar of green fern can be made without great difficulty. Any pole will do which is about a foot in diameter. It should be about four feet high. Wire pockets can be attached at intervals all round the stem and filled with ferns, and on the top a dish can be placed and filled with a particularly fine plant. The pockets should not be too small—pieces of wire about 18 in. long and 9 in. deep lined with moss or fibre would answer the purpose. Little casks and tubs are splendid for large plants; tree-trunks hollowed out can be used with charming effect, and stone rockeries are always possible, and do not entail much labour.

Plate 33. **Showing Interior of Reed Conservatory.**

For soil use anything you have, but be sure and add sand if necessary, as the soil for ferns must be porous. Leaf mould is a valuable addition, and a little wood ash—not *coal* on any account—if you can get it, and add some of the baked soil which lies underneath a brick kiln. But the great point to remember is that the soil must be porous, and for this sand is indispensible. Most ferns object to manure. For maiden-hair use the following mixture twice a month as a substitute. Have two buckets, in one pot 4 gallons of water to 2 pounds of soot; in the other 4 gallons of water to 12 pounds of common stable manure. Both the soot and the manure should be in a bag, so that only the liquid is used. Mix them in equal parts and dilute them with 12 times the quantity of water. This solution will be quite strong enough; even then the roots only of the ferns should be watered. Do not let the liquid touch the leaves, or they will wither.

There are many hardy ferns which like rich ground, heavily manured in the usual way. Such is the sword fern, and such are the caladiums, the drizena, the elephant's ear, and the large bamboo begonias, with their beautiful trusses of flowers, scarlet, pink, or white. All these plants grow easily, and soon repay attention. For covering a rockery quickly and giving a green appearance in the shortest possible time, there is nothing like the Japanese creeper—familiarly known as the "Wandering Jew" or "Creeping Jenny." There are three varieties, dark red, green, and ivory white, and they are excellent for hanging baskets or pillars. Then smilax is both dainty and easy to grow from seed; while another quick grower is the "African Toy." These can always be removed to make room for rarer plants later on, when the conservatory is established. But the rockery in which you plant your maiden-hair should have nothing else in it. Like the rose, maiden-hair is a jealous plant, and grows best where it reigns alone.

Lastly, remember that your conservatory needs daily attention, and should always be watered every morning. This promotes thorough drainage, and will prevent the ground turning sour. In very hot, dry weather baths of water may be placed in the conservatory and the air moistened by placing an occasional hot brick in the bath so as to promote evaporation.

AGRICULTURE IN AMERICA.

By William Macdonald, Ph.D.

No. IV.

IN the first paper of this series the subject of dry land farming was discussed with some detail. But since the agricultural prosperity of this Colony will mainly depend on the use we can make of our unwatered lands, and, moreover, as many of our readers are keenly interested in this branch of farming, it may not be out of place to again refer to the methods in vogue and the progress made in a typical Western State. Professor Elwood Mead, a well-known authority, in his work on "Irrigation Institutions," makes the following arresting remark:—"If every drop of water which falls on the mountain summits could be utilised, it is not likely that more than 10 per cent. of the total area of the arid West could be irrigated, and it is certain that, because of physical obstacles, it will never be possible to get water to even this small percentage."

Now of the several States which of late years have made a special study of dry land farming, Utah was the first to devise systematic experiments; and, as we have already said, six Arid Experimental Farms have been established in different parts of this State for the purpose of finding out the best methods of tillage and of testing the varieties best adapted to the different localities. With the establishment and encouragement of these Government farms, there has been an enormous increase in the acreage cultivated without water. This area is being constantly extended. In San Juan County, in the south-eastern portion of the State, there is a high plateau which is estimated to contain more than a million acres of arable land adapted to dry land farming. Further, it is instructive to note that the first experiments in dry land farming began around the fringe of well-watered lands, but now the higher mesas, which cannot be reached by irrigation canals, are being reclaimed solely by the plough and harrow.

Naturally, in dry land farming the most important factor is the rainfall; and its amount, distribution, and variation must therefore be carefully studied by all who propose to take up farming on arid lands. In Utah most of the rain occurs during the winter months, whereas the characteristic feature of the dry lands of the Great Plains—the Dakotas, Kansas and Nebraska—is the relatively heavy summer rainfall and dry winter. In a similar manner we might compare the Cape Colony with the Transvaal.

Plate 34 shows the average monthly rainfall at four places in Utah where dry land farming is now carried on. On the same sketch is shown the rainfall at four points in the Great Plains region, east of the Rocky Mountains, where it will be seen that the heaviest rainfall is during the summer months, forming a striking contrast to the rainfall of Utah.

Now, a word as to those places. Logan is situated near the northern boundary of the State, in the Cache Valley, where dry land farming has been carried on for a quarter of a century. Tooele

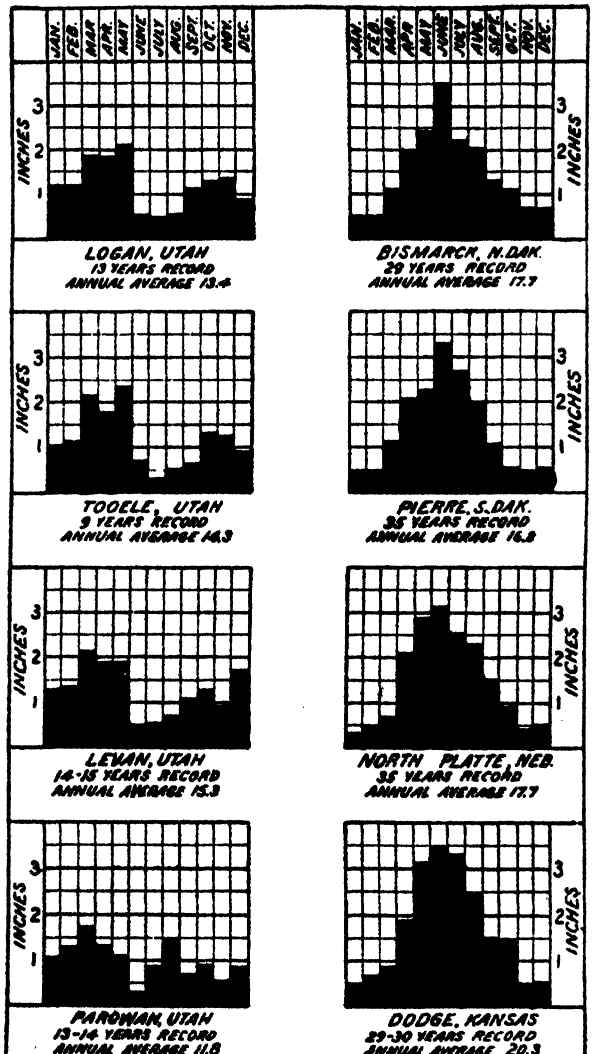


Plate 34.

Diagrams showing average monthly rainfall at eight points in Western America.

(After Scofield.)

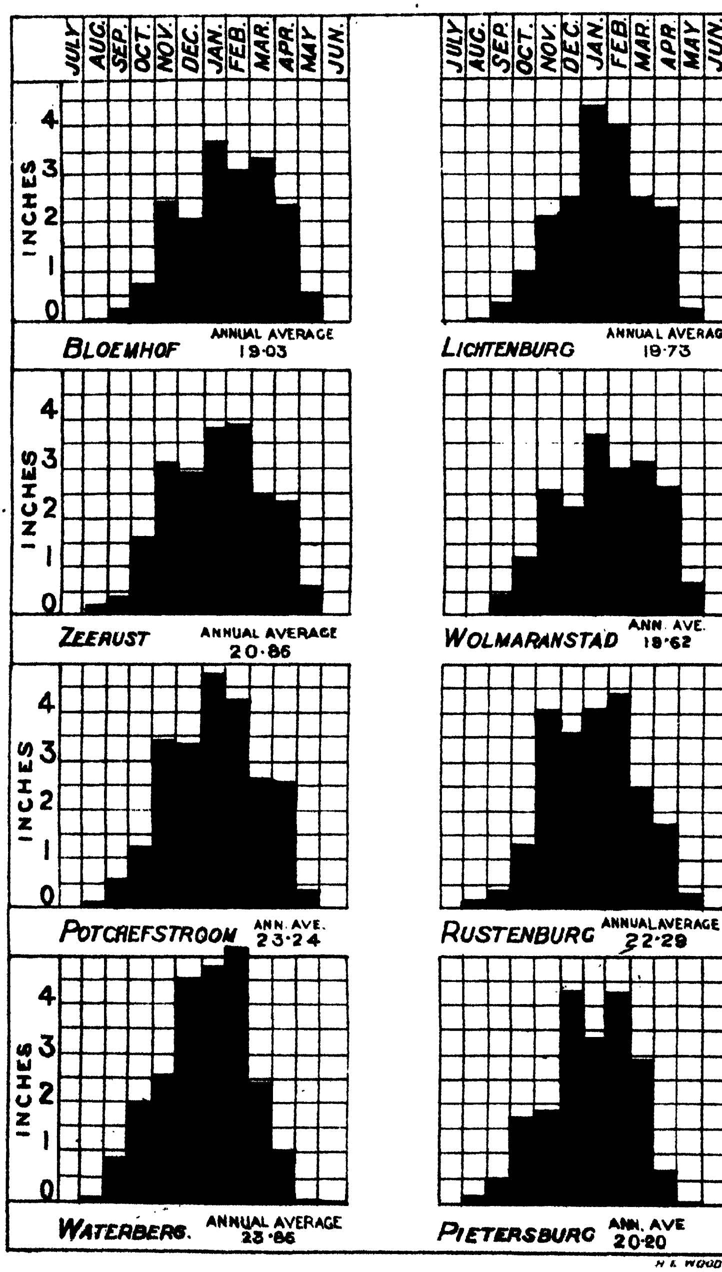


Plate 35.

Diagrams showing average monthly rainfall at eight points in the Transvaal.

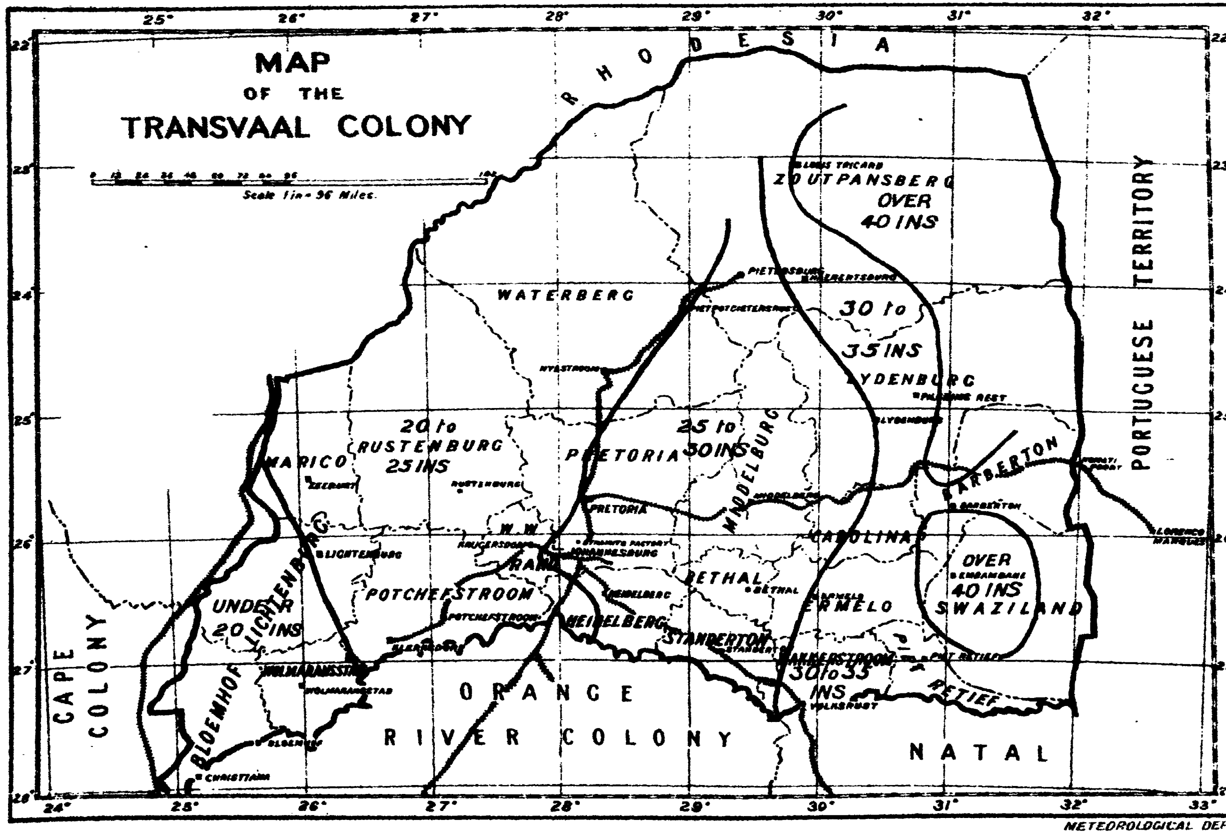


Plate 38.

Average rainfall over the Transvaal.

(As determined by records for the three seasons 1904-5, 1905-6, 1906-7.)

The rainfall in certain parts of the Zoutpansberg reaches 100 inches, but the average for the whole district is 40.

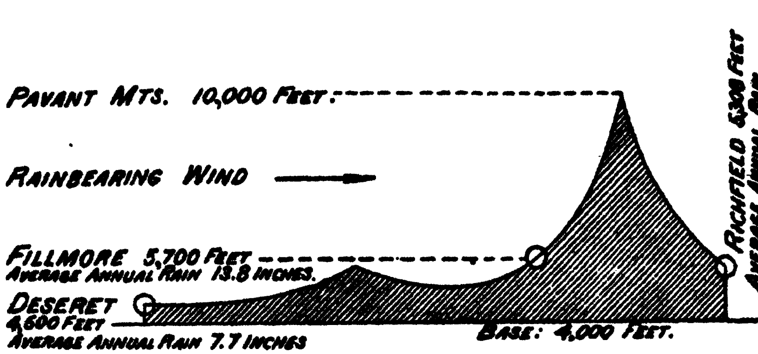
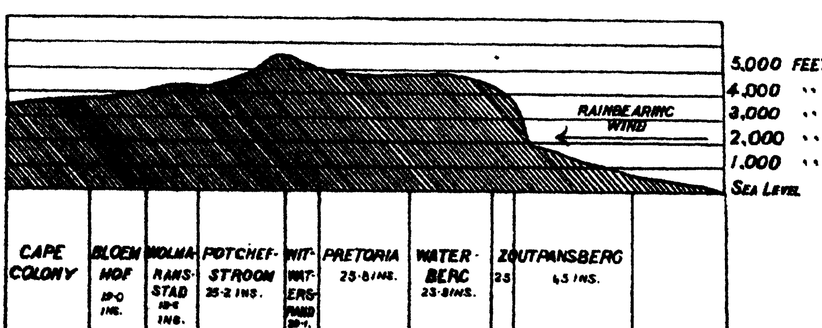


Fig. 1.—In Utah.

Showing difference in rainfall of two places situated on opposite sides of a mountain range.



SECTION ACROSS THE TRANSVAAL FROM N.E. TO S.W.

Plate 37.

Fig. 2.—In the Transvaal.

Showing influence of mountain range—northern extension of Drakensberg on the rain-bearing wind.

lies in a broad valley directly south of the Great Salt Lake. This valley has an altitude of about 4,000 feet, and is one of the largest in the State where dry land farming is possible. Levan is situated in a comparatively barren valley in the central part of the State, and there, since 1900, the development of dry farming has been very rapid. Parowan, in the south, lies in one of the smaller valleys to the east of the Escalante Desert. Here the rainfall ranges from 7 in. to 21 in. per annum.

The next Plate (No. 35), which was specially prepared through the courtesy of Mr. R. T. A. Innes, Director of Meteorology for the Transvaal, shows the average monthly rainfall at eight different points in this Colony, and affords an interesting comparison with the rainfall of Utah and the Great Plains region.

Mr. Innes states that the driest part of the Transvaal as revealed by the three seasons' records, 1904-5, 1905-6, 1906-7, is that surrounding Pietersburg, where the rainfalls were 13.7 in., 14.3 in., and 32.6 in. respectively. (Plate 36.) The dry land farmer in the Traansvaal has therefore a good rainfall as compared with the dry land farmer in America. But it must not be forgotten that the heavy snows of America are of great value in crop production. With regard to the total amount of rain, the Transvaal has nothing to complain of. It is its unfortunate distribution that creates farming difficulties. The only certain rainfall occurs during the period November to March. Rains are indeed common in October but sometimes do not come. Thus, since 1892, at Pretoria, out of sixteen Octobers we find two with less than 0.5 in., four with less than 1.0 in., and seven with less than 1.5 in.

In passing we may note that the rainfall of 1906 was phenomenal in the West, and undoubtedly encouraged the apostles of dry land agriculture. But it is also true that the agitation in favour of dry land farming took place in Utah in 1902 and 1903, when the rainfall fell below the average; and, as we have elsewhere pointed out, the early interest in desert lands can be traced as far back as the building of the first canal. Be that as it may, we met many persons in Utah who confidently stated that vast tracts of land could be successfully farmed without irrigation. True, dry years will come again, but it will find the colonists of Utah better prepared, just as the flock-masters of Australia have well learned those bitter lessons taught them in the days of their adversity, when the shadow of drought lay upon the sheep runs of the Commonwealth.

A matter which must be carefully studied in dry farming is the effect of local topography. Mr. Carl S. Scofield gives an admirable illustration of this in Bulletin No. 103 of the Bureau of Plant Industry, U.S.D.A. The following sketch will make this plain, and serve to emphasize this phenomenon. (Plate 37, Fig. 1.)

The town of Deseret lies well out in a broad valley, which is too dry for farming except with irrigation. About thirty miles south-east of Deseret is the town of Fillmore, which lies close to the western slope of a mountain range, the crest of which is 10,000 feet above sea level. The total annual rainfall at Deseret is 7.7 in., and at Fillmore 13.8 in., a difference due to the effect of the mountains. Richmond is situated only sixteen miles from Fillmore, but on the opposite side of the mountain

range, and here the average annual rainfall is 5.5 in. Such facts clearly show the difference in the rainfall of two places situated on the opposite sides of a mountain range. The influence of a mountain range on the rain-bearing wind is well shown in the Transvaal by the following sketch, kindly prepared by Mr. W. H. E. Wood of the Meteorological Department. (Plate 37, Fig. 2.)

* * * *

The usual methods of tillage in Utah consist of deep ploughing, frequent cultivation, and alternate-year cropping. Autumn-sown wheat has been so far the chief crop grown on dry lands. The land is then ploughed as soon as possible, and left in the rough furrow all winter. As soon as the winter rains have thoroughly soaked into the ground surface cultivation is begun. This is usually done by means of a disc harrow. Sometimes a shallow summer ploughing is given to turn under any weeds. In the late summer a spike-toothed harrow is used to form a fine seed bed, and the next crop is sown in the month of September or early in October. As the winter rains tend to compact the soil it is usual to lightly harrow the wheat crop in the early spring, as once it starts to grow nothing more can be done to conserve the moisture. The grain is usually harvested with a header so that there is always a large amount of straw to plough under. It has thus been found best to grow a crop of wheat and then spend a whole year in clean cultivation, in order to conserve the moisture, before sowing the subsequent crop.

The old agricultural practice of fallowing or ploughing land and then leaving it untilled for a time was adopted to render the soil more tender and mellow, and at the same time to destroy weeds. But in Utah and the other Western States, where dry land farming is now much in vogue, the term "fallow" is commonly used to mean land left bare but constantly stirred to conserve moisture. All farmers know that moisture is lost very rapidly from a soil if the surface is not stirred; and so with crops that cannot be inter-tilled such as wheat, oats, and barley, much moisture is wasted by direct evaporation during the growing season; but with crops that can be inter-tilled during the growing season, such as mealies, potatoes, and mangels, a much larger amount of moisture can be held in the soil by means of the *soil mulch* or dust blanket, as it is commonly called.

Thus it is manifest that the success of dry land farming depends upon the possibility of storing enough water in the soil to carry the crop to maturity; and, consequently, the water-holding capacity of any soil becomes a matter of great importance. The dry land farmer should, therefore, carefully survey his fields, and unhesitatingly select the deep, rich, mellow lands in preference to the poor, light and sandy soils whenever the storage of water from one season to another is the main object in view. For us the utilisation of the dry lands of the Transvaal is a problem of profound moment; and we may count ourselves truly fortunate in having such a famous dry land crop as the humble mealie ready to our hand.

In Utah wheat and lucerne are the main crops in dry land farming. The varieties of wheat grown are nearly all light coloured, and belong to the class commercially known as "soft wheats." On the State experimental farms varieties of Durum wheat, the spring wheat of the Upper Mississippi Valley, such as Fife and Blue-stem, and also some types

of the hard red winter wheats, such as are commonly grown in Kansas and Nebraska, are being tested. Efforts are being made to breed drought-resistant varieties.

Lucerne is the standard forage crop. At first it was grown only under irrigation, but it is now being widely cultivated on the dry lands. It is important to note that up till the present no serious effort has been made to secure varieties suited to dry land farming, and so it happens that seed from irrigated land is almost invariably sown on dry lands. It is probable that drought-resistant varieties could be developed in a comparatively short time if proper attention were given to selecting seed that has been grown upon dry lands. For this reason the seed imported from the Oudtshoorn district, Cape Colony, can hardly be well suited for growing upon the dry lands of the Transvaal. And there is need for our farmers to insist upon our seed merchants classifying lucerne seed thus:—(a) *Seed from Dry Lands*, and (b) *Seed grown on Irrigated Lands*.

It is highly probable that the method of sowing lucerne in rows wide enough to permit of inter-tillage, as is advocated by Mr. Burtt-Davy, the Government Agrostologist and Botanist, for the dry lands of the Transvaal, will be found to be the best plan for raising forage as well as for seed production. As Mr. Scofield remarks in his monograph on this subject:— "It is well known that isolated alfalfa (lucerne) plants when allowed to mature on these dry lands produce relatively large quantities of seed. This is probably due, in part, to a better illumination on all sides of the plant, resulting in a larger number of flowers, in part to the drier air surrounding these flowers during the pollination period, which appears to have some bearing in seed production; and in part to the greater ease of access for insects of various kinds that promote pollination. It is certainly true that the partial isolation of the plants secured by row planting results in greatly increased yields of seed per plant, and there is strong probability that the yields per acre would be larger, so that experiments to determine this point would be well justified." Furthermore, thin seeding has been found to give the best results. In the more humid regions of America farmers sow about 75 lbs. of wheat to the acre, and from 15 to 20 lbs. of lucerne. But in Utah, on the dry lands, it has been found that much better crops of wheat are obtained when only 45 lbs. per acre are sown and about 8 lbs. of lucerne. It is conceivable that heavy seeding makes the struggle for existence more severe amongst the plants themselves, and results in an early demand for an excess of soil moisture before the young plants are properly formed.

The development of dry land farming is teaching the American farmer the old but too often forgotten lesson of the value of constant tillage. The most common error in Western farming is over-irrigation with little or no cultivation. Unfortunately, the same remark might be made of the Transvaal farmer. It is far easier to irrigate than to cultivate when a crop shows signs of distress, and the soil soon becomes stagnant with a surplus supply of water. Sunshine and air are excluded: the fertility of the land impaired; and the root system of the crop often permanently injured. When farmers realise that many crops can be successfully grown with good cultivation they will hesitate before

embarking upon expensive irrigation schemes, and they will seriously study the problem of better tillage before they finally face the cost of construction.

Again, farming with irrigation usually costs more per acre than dry land farming. The products of irrigated land, such as vegetables, fruits, and forage crops, are well adapted to the local market; while grain crops, such as maize for oversea export, can be produced much more cheaply on dry lands. But undoubtedly the safest method of dry land farming is to use it, whenever possible, as an adjunct to irrigation; and the arid West is now dotted with windmills, which tap artesian veins; while small dams are built to collect the surface water and so secure for the settler, even in the severest drought, a little fruit, a few vegetables, and some grain for his table, and forage for his animals. Thus the two parts of a farm—the dry lands and the lands under water—are made to supplement one another to their mutual advantage. At present the Federal Government of the United States is carefully considering a scheme of hydrographic survey for the purpose of determining the extent and location of underground water in the dry farming regions of the West. Without such a survey a settler may spend his life in the immediate vicinity of water or waste much money in fruitless attempts to locate wells.

THE VETERINARY SECTION.

FURTHER TRANSMISSION EXPERIMENTS WITH EAST COAST FEVER.

By Dr. Arnold Theiler, C.M.G., Government Veterinary Bacteriologist.

In my annual report for 1903-4 I enumerated various experiments, the conclusions of which were as follows:—

Rhipicephalus decoloratus (the common blue tick) is not a host of Piroplasma parvum (East Coast fever).

Rhipicephalus Evertsi (the red tick) is not a host of Piroplasma parvum (East Coast fever).

Rhipicephalus simus (the black-pitted tick) is a host of Piroplasma parvum (East Coast fever).

Amblyomma Hebraeum (the bont tick) may be a host of Piroplasma parvum (East Coast fever).

Rhipicephalus appendiculatus (the brown tick) is the principal host of Piroplasma parvum (East Coast fever), and it was further stated that brown ticks transmit the disease principally in their imago stage, after having fed as nymphæ on sick beasts; less so as nymphæ after having fed as larvæ, and not at all as larvæ originating from a mother tick removed from a beast infected with East Coast fever. In other words Piroplasma parvum (East Coast fever) does not pass from the female imago into the egg, and from this into the larvæ, as is the case in Texas fever. These experiments were carried out almost simultaneously with those of Mr. Lounsbury, of Capetown, and, as a result, the facts were established that the blue tick, under no conditions, acts as a host of Piroplasma parvum (East Coast fever), and that the brown tick (the tick with three hosts) is the principal carrier of the disease.

In 1906, Mr. Lounsbury published a further series of experiments which proved that, besides the ticks mentioned others transmit the disease, viz., Rhipicephalus nitens (the shiny brown tick), evertsi (the red tick), and capensis (the Cape brown tick). In Menses Handbuch der Tropenkrank-heiten, 1906, a contribution appeared by Luhe regarding the protozoa parasite in the blood, and in regard to my statement that "Piroplasma parvum does not pass through the egg," he makes the objection that, in my experiments, the larvæ which were employed were too young, and he quotes a communication of Professor Koch, who exposed larval ticks, hatched in the laboratory, on a pasture, and thus created a new herd of infection. Professor Schilling, in his contribution on piroplasmosis in the Handbuch der Pathogenen Mikroorganismen, said that Gray and Robertson had already expected that Rh. decoloratus (blue tick) had to be considered as a carrier of the disease. From former experiments Koch knew that the German East African Coast fever, which had proved to be identical with the Beira Coast fever, was transmitted by ticks. Koch took female ticks which had repleted themselves on

sick cattle and placed them in a warm and humid atmosphere for the laying of the eggs; these larvæ were placed on a pasture on which hitherto only a few animals had become infected with East Coast fever. The young ticks did not leave the pasture, but were waiting on the tops of the grasses until the cattle passed by in order to attach themselves. Soon after, and on this very pasture, grave cases of East Coast fever began to appear, and it was possible to infect every fresh susceptible animal which was liberated on this place.

It is apparent, from the above communication, that the opinions of Mr. Lounsbury and myself (who do not consider the blue tick as a carrier of the disease) are the reverse to those of Professor Koch. In Koch's experiment, as cited by Schilling, he speaks of ticks in general, but, at the Inter-Colonial Veterinary Conference held at Bloemfontein, in 1903, Koch, in referring to this particular experiment, speaks exclusively of the blue tick.

It must be stated here that the experiment, as carried out by Professor Koch, does not withstand strong criticism. It was performed by placing young larval ticks on a pasture on which hitherto only a few animals had become infected, that is to say, on an East Coast fever infected pasture. Accordingly, with the introduction of fresh susceptible cattle, the spread of the disease had naturally to be expected, and would have taken place even if the new ticks had not been liberated. Indeed, it is probable that, between the first and second exposure of susceptible cattle, the larval and nymphal ticks already present had moulted, and thus were responsible for the increase of the disease.

With regard to my statement that an animal immune against East Coast fever does not act as a propagator of this disease, Professor Schilling says: "In his last report, Theiler's experiments would prove that salted cattle do not infect the ticks (which species?). This is directly contradictory to the history of the introduction of the disease into Rhodesia. From which cattle did the animals imported from New South Wales contract the infection if not by means of ticks from the herds grazing in the neighbourhood of Beira, amongst which, as Koch has proved, carriers of parasites were constantly present?" The results of my experiments proving that salted cattle do not transmit the infection were published in my annual report for the year 1904-5, and also in the Journal of Comparative Pathology and Therapeutics in the year 1905, under the title, "Do salted cattle contain Piroplasma parvum in their blood?" In this article it was proved that the brown tick (Rh. appendiculatus), neither in the nymphal nor the imago stage, is capable of transmitting East Coast fever after having fed as larvæ or nymphæ on an immune animal. These results were corroborated by Lounsbury in his investigations published in 1905-6 under the title "Ticks and African Coast Fever." Lounsbury experimented sixteen times on nine different animals with ticks of which he was sure that they were acting as hosts of Piroplasma parvum (East Coast fever), viz., Rh. appendiculatus (the brown tick), in their nymphal and imago stage, with Rh. nitens (the shiny brown tick) and evertsi (the red tick), in their imago-adult stage, and in no case could he transmit the disease from the immune animal to the susceptible one. Convincing proof can be found in

practice, since it is frequently noted that immune animals have been grazing with susceptible ones for years on one and the same pasture, and yet the latter have never contracted the disease.

We are in possession of ten immune (salted) oxen which, in 1902, were the survivors of a herd of 500 head destroyed by the disease. These ten oxen have been repeatedly exposed on an infected area, thereby proving their immunity. For over four years they constantly grazed with a herd of about 50 susceptible animals on a non-infected pasture on which brown and red ticks were present but, hitherto, no disease has been noted. This experiment was purposely continued for this length of time in order to exclude every possibility of coincidences. Therefore the occurrence in Beira can only be interpreted in a different manner. From Mr. Gray's report to the Rhodesian Government it clearly follows that the Australian cattle imported into Beira were only suffering from redwater (Texas fever), and this was the reason for bringing them to the higher town of Umtali, in which place the extraordinary appearance of East Coast fever was noted. The cattle grazing in Beira had nothing to do with the infection of the cattle in Umtali. Indeed, it has to be accepted that, at least at that time, Beira was not infected with East Coast fever, and, in proof of this, it must be mentioned that Madagascar oxen which were imported into Beira almost simultaneously with the Australian herd never suffered or died of East Coast fever, and not even after the Australian cattle had been removed to Umtali. Madagascar cattle are equally susceptible to East Coast fever as Australian cattle, but the former are immune to ordinary redwater, whereas the latter are not.

From the following communication of Mr. Orpen, late Head of the Agricultural Department, Rhodesia, and which appeared in the periodical "South Africa," dated March 18th, 1905, it is clear that Beira was infected with redwater, and that slaughter cattle from East Africa imported direct from Umtali, probably brought East Coast fever with them:—

". . . . Before the arrival at Beira in November, 1900, of the shipment of a thousand herd of cattle, which Mr. Rhodes introduced from New South Wales as the first of an intended series of such importations by bought or chartered steamers for the purpose of supplying the European settlers with stock, a gentleman in Umtali introduced by railway into that town a number of slaughter cattle which had come from German East Africa through Beira. Part of them he kept for some time on Umtali commonage, and others he passed on to Salisbury where they were slaughtered at the poles in the Makabusi Valley, on the commonage of that town. Not long after this, and just in those two places, some cases occurred of typical African Coast fever, and then there began to spread from those two places along the various roads in Rhodesia a mixed infection of redwater and this new fever, till then unknown to science, and indistinguishable from ordinary redwater, of which it was, of course, supposed to be only a severe form. No such outbreak occurred in the Portuguese territory through which the cattle had been brought quickly by rail.

"Soon after the introduction of these diseased animals, there arrived at Beira the splendid and healthy cattle from Australia which Mr. Rhodes was introducing. A breakdown occurred on the railway, and the imported cattle had, therefore, to be pastured on the Beira flats, as many others had been before. None previously pastured there had contracted African Coast fever, which does not appear to exist there at all. But these Australian cattle, coming from a country where no redwater exists, and thus being susceptible, contracted that disease and began to die.

"Their subsequent history is fully and faithfully narrated by Mr. Gray in his reports published on pages 220 to 230 of the British South Africa Company's report to shareholders for 1903. The cattle were then taken to Umtali by rail, and thence to a neighbouring Government farm and isolated from all other animals. Most of them died there of ordinary redwater, but it is evident from the report that many of them eventually died of 'African Coast Fever,' which, as I have shewn, had been brought to Umtali from German East Africa. . . ."

* * * *

The following experiments were partially carried out for the purpose of corroborating my former communications; some of the experiments of Lounsbury's were repeated, and the opinion of Lube was considered as correct, and, accordingly, taken into consideration. The ticks for these experiments were collected on the coast at Durban from cattle which were all visibly suffering from East Coast fever, the diagnosis being confirmed either by *post mortem* or by microscopical examination:—

EXPERIMENT 1.—To prove that ticks collected on the coast of Natal from sick animals are capable of transmitting East Coast fever. (*a*) Experiments with brown imagines (adult ticks).

N.B.—The brown nymphæ used for infesting the following animals were all collected on the 16th December, 1906, in Durban.

"*A*," *Ox* 358.—Two years old; from Cape Colony. Infested with twelve brown imagines, about ten days old, on the 17th January, 1907. On the 26th January a fever reaction started, and, on the following day, Piroplasma parvum (East Coast fever) was present, daily increasing in numbers until the 10th February, on which day the animal died of East Coast fever.

"*B*," *Ox* 387.—From the Cape Colony; 1 year old. Infested on the 1st March, 1907, with nine brown male imagines (adult ticks), about 27 days old. Temperature commenced to rise on the 11th March, and Piroplasma parvum (East Coast fever) was noted six days later, daily increasing in numbers until the death of the animal on the 26th March, 1907.

"*C*," *Bull* 327.—Two years old; from Potchefstroom, a district hitherto free from East Coast fever. Infested on the 4th April, 1907, with brown imagines about 62 days old, and, in the morning of the 15th April, the temperature commenced to rise. The disease lasted until the 24th day after infestation, on which date the animal died of East Coast fever.

Piroplasma parvum (East Coast fever) was noted daily in the blood from the 19th April up to the time of death, on which date Piroplasma bigeminum (ordinary redwater) also appeared.

"*D*," *Heifer* 416.—Born on the station, and about 1 year old. Infested on the 19th March with male and female imagines (adult ticks) about 46 days old. After an incubation time of about ten days the temperature started to rise, culminating in the death of the animal on the 13th April, 1907. Piroplasma parvum (East Coast fever) noted daily from the third day after rise of temperature.

"*E*," *Ox* 391.—A Cape Colony animal; aged. Infested on the 23rd April, 1907, with male and female brown imagines, 108 days old. After an incubation time of eleven days the temperature of this animal rose, and the disease lasted eight days. Piroplasma parvum (East Coast fever) noted daily from the third day after reaction, the animal dying of East Coast fever on the 12th May, 1907.

EXPERIMENT No. 2; with larvæ of blue ticks which were collected at the same time and from the same animals as the ticks used for the previous experiments.

In the previous experiments with imagines of Rh. appendiculatus (the brown tick), absolute proof was given that these brown ticks from the Natal cattle were capable of communicating East Coast fever. If the blue tick is a host of Piroplasma parvum (East Coast fever), it must be granted that blue ticks originating from the same animals which supplied us with the pathogenic brown ticks must also transmit the disease, especially if they were placed on animals in large numbers.

N.B.—The larvæ utilised for the infestation of the following animals hatched from the 23rd March, 1907, onwards.

"*A*," *Heifer* 421.—A two-year-old from Aliwal North. Heavily infested with blue tick larvæ, about twelve days old, on the 4th April, 1907. From the 29th April the dropping engorged females were collected in great numbers. This heifer did not sicken and is still alive.

"*B*," *Heifer* 426.—Two-year-old from Aliwal North. Infested with blue larval ticks, about twelve days old, on 4th April, 1907. No result; the animal is still alive.

"*C*," *Heifer* 400.—Aliwal North, 2 years old. Infested with larval blue ticks on the 24th May, 1907, two months after they had hatched. The repleted females dropped from the 19th June, 1907, in large numbers. No disease ensued; the animal is still present amongst our herd.

"*D*," *Calf* 440.—Born on the station; about 6 months old. Infested with blue larval ticks, about 60 days old, on 24th May, 1907. No result; the animal was utilised on the 1st August, 1907, for experiments in connection with pleuro-pneumonia (lungsickness), and died as a result of the inoculation on the 26th August, 1907.

EXPERIMENT No. 3; with blue tick larvæ originating from an ox immune against East Coast fever.

"*A*," *Ox* 377.—An animal from Sjamboks Kraal, Pretoria District, and one of the survivors of a herd consisting of about 200 which were all destroyed by East Coast fever. The diagnosis in this animal was made by proving the presence of Piroplasma parvum (East Coast fever) during the disease. On the 9th March, 1907, Ox 377 was purchased and brought to the station, and is still here at the present time. At repeated intervals 377 was infested with blue ticks, and the brood of larval ticks of the last lot collected were utilised for the succeeding experiments. In order to prove that this ox was immune to East Coast fever, it was infested with brown imagines (adult ticks) on the 4th April, 1906. These brown imagines (adults) belong to the same collection as those which produced the disease on animals 416, 327 and 391. No signs of illness were noted, and hence further proof is given of the immunity of this ox.

N.B.—The larvæ used for the infestation of the following animals hatched on the 5th November, 1906.

"*B*," *Heifer* 413.—Two-year-old from Pretoria; infested on the 5th December, 1906, with blue tick larvæ 31 days old. Seven days after infestation a rise of temperature was noted for seven days, followed by a second rise running for a longer period during which spirillum were noticed for several days. The repleted females dropped from the animal on the 23rd December, 1906, and were collected in great numbers. In order to make sure whether the reaction had any connection with East Coast fever, it was decided to test this animal on its immunity. Accordingly, 413 was infested on the 16th April, 1907, with nymphal brown ticks which had repleted themselves on animal 387 during the time it was suffering from East Coast fever. From the 22nd April, 1907, onwards, the dropping nymphæ were collected. On the 27th April, 1907, fever appeared in animal 413; Piroplasma parvum (East Coast fever) was noticed from the 2nd to the 9th of May, on which latter date Piroplasma bigeminum (ordinary redwater) was seen, and the animal died on the 11th May.

"*C*," *Ox* 359.—Two years old from Aliwal North. Infested on the 5th December, 1906, with blue larval ticks about 31 days old. In this animal a slight reaction was noticed the nature of which was recognised. 359 was an animal used in a former experiment in connection with Piroplasma mutans (a form of gallsickness), and had been injected on the 24th August, 1906, frequently showing Piroplasma mutans at repeated intervals from the 25th September, 1906, so that the reappearance of these parasites during the time of the tick infection must be considered as a coincidence, but the very fact that Professor Koch identified these ring-shaped parasites with Piroplasma parvum (East Coast fever) induced me to test this animal on its immunity to East Coast fever. Four brown females originating from Durban were placed on 359 on 13th February, 1907, and,

ten days later, a rise of temperature was noticed. On the 2nd March, 1907, Piroplasma parvum (East Coast fever) was seen increasing rapidly until seven days later, when the animal died of East Coast fever.

EXPERIMENT No. 4.—To transmit East Coast fever with red ticks (Rhipicephalus Evertsi).

As already stated, my previous experiment with red ticks was negative. This was carried out by placing numerous red ticks on one and the same animal without the disease being noticed, but, as only one animal was utilised, the objection may be raised that, by a coincidence, the animal was immune.

"*A*," *Ox* 357.—Two-year-old animal from Aliwal North. Infested on the 23rd April, 1906, with red imagines which were collected from animals suffering from East Coast fever at Sjamboks Kraal. A further infestation took place on 25th and 26th April, and, commencing on 5th May, the repleted females dropped, and a rise of temperature began five days later. On 15th May, Piroplasma parvum (East Coast fever) was noticed for the first time, increasing rapidly until 29th May, on which day the animal died.

"*B*," *Cow* 455.—Originating from Pretoria. Infested on 23rd May, 1907, with red imagines 67 days old, which, in their larval and nymphal stage, had been feeding on Ox 358 whilst it was suffering from East Coast fever, and which had moulted on 17th March. After an incubation time of fourteen days, fever appeared. The reaction lasted thirteen days, and the animal died on the 19th June, 1907. Piroplasma parvum (East Coast fever) noted four days after the beginning of the reaction and increased daily.

"*C*," *Heifer* 45.—Infested in London by Stockman on the 25th June, 1906, with the same brood of ticks utilised in the first experiment, a number of which were sent to Mr. Stockman, M.R.C.V.S., of England, in order to control the appearance or otherwise of Piroplasma parvum (East Coast fever) in cattle outside South Africa, and especially to show whether Piroplasma parvum (East Coast fever) would develop in cattle that never have been in contact with South African animals. Commencing on the 8th July, 1906, the animal showed a typical reaction, and died on the 10th July, 1906, on which date Piroplasma parvum (East Coast fever) was noticed in almost every blood corpuscle. Stockman was good enough to forward me blood preparations for examination, and the correctness of the diagnosis was indisputable.

EXPERIMENT No. 5: with Amblyomma Hebræum (the bont tick). These ticks were also collected from cattle on the coast of Natal. It is known that this specie belongs to the ticks with three hosts. Hitherto we have found that (*a*) ticks with three hosts are capable of transmitting the disease as nymphæ, after having fed as larvæ on sick animals; (*b*) as imagines (adults) after having fed as nymphæ on sick cattle, and (*c*) it has naturally to be expected that the infection passes through the egg.

(*A*) *Imagines of Amblyomma Hebræum* (adults of the bont tick).

"*A*," *Ox* 391.—A full grown ox from Klipplaats, Cape Colony. Infested on the 4th March, 1907, with imagines about 78 days old, collected on the 16th December, 1906, from sick cattle on the Durban coast. Reinfested on the 5th March, 1907, and, the following day, male and female ticks were found fast. The engorged females dropped on the 30th March, 1907; no reaction was noted. Ox 391 was tested later on its immunity against East Coast fever and died (compare Experiment 1.E.).

"*B*," *Ox* 389.—Full grown; from Klipplaats, Cape Colony. Infested on the 26th March with imagines, about 100 days old, from the same collection as the previous case. The repleted females were collected from the 7th April, 1907; no reaction ensued. This ox was tested on its immunity on the 6th May, 1907, with nymphæ which, as larvæ, had fed on Ox 387 during its illness. A rise of temperature was noted on the 18th May, and a typical fever reaction followed. Piroplasma parvum (East Coast fever) was noted on the 25th May, 1907, and was very frequent five days later. In order to obtain blood for the purpose of hyperimmunisation, this animal was bled to death on the 30th May, 1907.

(*B*) *Larvæ of Amblyomma Hebræum* (the bont tick).

These originated from female ticks which were collected on the 18th December, 1906, in Durban. The eggs had been laid on the 27th December, 1906, and had hatched on the 18th April, 1907.

"*C*," *Heifer* 418.—Two years old; from Aliwal North; infested on the 24th and 25th May, 1907, with the above larvæ which, on this day, were 36 days old. No reaction noted, and the animal is still alive.

"*D*," *Heifer* 419.—A two-year-old from Aliwal North; infested on the same date and with the same brood of larvæ, about 36 days old. No reaction; the animal is still alive.

Experiment No. 6; with Rhipicephalus capensis (the Cape brown tick).

As already stated, Mr. Lounsbury proved that these ticks, which are especially frequent in the south-eastern parts of Cape Colony, are capable of transmitting East Coast fever. This is also a tick with three hosts. Lounsbury sent me infected imagines (adult ticks) which were utilised to verify his results.

"*A*," *Heifer* 379.—Originating from Capetown; infested on the 15th June, 1906, with the above imagines. After an incubation period of 30 days the disease was noticed. The animal died on the 43rd day after infestation, *i.e.*, 28th July, 1906. Piroplasma parvum (East Coast fever) was noticed on the 20th July for the first time and increased daily. On the day previous to death Piroplasma bigeminum (ordinary redwater) was also seen.

"*B*," *Heifer* 383.—Originated from Capetown; was kept in the same stable as the previous animal, but not infested with imagines (adults), notwithstanding which East Coast fever appeared. The disease could only have been transmitted by

the ticks from Heifer 379, inasmuch as at that time no experiments were carried out with any other species of ticks; this is the sole accidental infection that has occurred on our station. The animal died on the 30th July, 1906.

EXPERIMENT No. 7.—Transmission of East Coast fever with progeny of infected brown ticks which, as imagines, were collected on sick animals in Natal.

I have already proved that Rhipicephalus appendiculatus (the brown tick) is the principal host of Piroplasma parvum (East Coast fever), and that the transmission in no case takes place *via* the egg, but in the nymphal or imago stages. However, should a transmission through the larval stage be possible, it has to be expected that this species would in the first instance be capable of so doing. The following experiments were accordingly made:—

"*A*," *Heifer* 386.—From Capetown; two years old. Infested on the 13th February, 1907, with brown larvæ whose mothers had been collected on the 16th December, 1906, in Durban. The females had started to lay eggs on the 20th December, 1906, which hatched on the 23rd January, 1907; thus, at the date of the infestation, the larvæ were 21 days old. On the 15th February, 1907, they were fast; they commenced to replete on the following day, and, on the 22nd February, 1907, the first dropping engorged larvæ were collected. Subsequently several infestations were made with the same brood of larvæ up to the 20th February, 1907. The dropping larvæ were collected until the 10th March, 1907, in great numbers. No reaction was noted; this animal died later from inflammation of the intestines.

"*B*," *Heifer* 394.—Two and a half years old; from Aliwal North; infested at the same time and with the same brood of ticks as in the former case, the larvæ being 21 days old. No reaction noted, and the animal is still alive.

"*C*," *Heifer* 398.—Two years old from Aliwal North; infested in the same way as above, the larvæ being 21 days old. No reaction.

"*D*," *Heifer* 402.—Two years old; from Aliwal North; infested as above, the larvæ being 21 days old. No reaction.

"*E*," *Heifer* 408.—Two years old; from Aliwal North; infested on the 12th March, 1907, with larval ticks from the brood used in the above experiments, which had hatched since the 23rd January, 1907, thus, on the date of infestation, were 48 days old. On the 15th March, 1907, brown engorged larvæ dropped, and, on the same date, the animal was infested with a fresh brood of brown larvæ whose mothers were collected on the 18th December in Durban, and which had hatched since 23rd January, 1907—thus were 49 days old. Engorged larvæ from 408 were collected in great numbers.

"*F*," *Heifer* 409.—Two and a half year old animal; infested for the first time on the 12th March, 1907, with larval ticks, 48 days old, of the same brood as in the former experiment,

and, on the 22nd March, 1907, was infested for the second time with brood of larvæ which had hatched on the 25th January, 1907, and, accordingly, were 56 days old. Engorged larvæ were collected from the 26th March, 1907, onwards. No reaction. The animal met with an accident on the 8th July at Onderstepoort and had to be killed.

"*G*," *Heifer* 412.—Two years old; from Aliwal North; infested on the 12th March, 1907, with brown tick larvæ which had hatched on the 23rd January, 1907—48 days old— and the engorged larvæ were collected from the 16th March, 1907. Reinfested on the same date with larvæ hatched on the 25th January, 1907—50 days old. Engorged larvæ collected from the 19th March onwards. A third infestation with larvæ of the same origin took place on the 22nd March, 1907, and the collection of the engorged larvæ commenced three days later. No reaction, and the animal is still alive.

"*H*," *Heifer* 420.—Two years old; from Aliwal North. Infested on the 12th March, 1907, with brown larvæ which had hatched on 23rd January, 1907, *i.e.*, 50 days old. A second infestation on the 16th March with larvæ hatched on the 25th January, 1907, *i.e.*, 52 days old. A third infestation with larvæ of the same origin on 22nd March, 1907, *i.e.*, 58 days old. No reaction.

"*I*," *Heifer* 422.—Two-year-old from Aliwal North; infested on the 12th March with brown larvæ originating from mother ticks collected on the 16th December, 1906, in Durban, and which hatched since 23rd January, 1907—accordingly were 48 days old. On the 16th March, 1907, a second infestation with larvæ which had hatched on the 25th January, *i.e.*, were 50 days old. No reaction, and the animal is still alive.

"*J*," *Heifer* 401.—Two-year-old from Aliwal North; infested on the 13th, 16th and 19th March, 1907, with larvæ whose mothers had been collected on the 18th December in Durban and which had hatched since 23rd January, 1907, and, consequently, were about 55 days old. No reaction, and the animal is still alive.

"*K*," *Heifer* 404.—Two-year-old from Aliwal North; infested on the 13th, 19th and 22nd March, 1907, with larvæ about 55 days old of the same brood as utilised above. No reaction, and the animal is still alive.

"*L*," *Heifer* 407.—Two-year-old from Aliwal North; infested on the 19th and 22nd March with the same larvæ as before, *i.e.*, about 55 days old. No reaction, and the animal is still alive.

"*M*," *Heifer* 453.—From Klipplaats, Cape Colony; infested on the 10th April, 1907, with brown larval ticks 18 days old originating from mothers collected on the 14th February, 1907, in Durban, and which had hatched since the 23rd March, 1907. No reaction; the animal is still alive.

"*N*," *Heifer* 454.—A two-year-old animal from Aliwal North; infested on the 19th April, 1907, with brown larval ticks whose mothers were collected on the 29th January, 1907, in

Durban, and which had hatched on the 24th February, 1907, accordingly, at date of infestation, were 54 days old. No reaction. A subsequent inoculation with blood from an animal immune against redwater caused 454 to contract this disease, and it died on the 20th July, 1907.

"*O*," *Heifer* 419.—From Aliwal North, and about two years old; infested on the 2nd April, 1907, with the same brood of ticks as used above, the larvæ accordingly being 65 days old. No reaction.

"*P*," *Heifer* 449.—A two-year-old from Aliwal North; infested on the 2nd April, 1907, as above, with larvæ 65 days old. No reaction.

"*Q*," *Heifer* 418.—About two years old, and imported from Aliwal North; infested on the 2nd April, 1907, with larvæ of the same brood as above, and which were 71 days old. No reaction.

"*R*," *Heifer* 455.—About two years old, and imported from Aliwal North; infested, as above, with larvæ 71 days old. No reaction.

EXPERIMENT No. 8; with nymphæ of the brown ticks whose mothers had been collected in Durban, and which, as larvæ, had been utilised in the previous experiments.

The origin of the following animals is:—Heifers 435 and 439 came from England; 440 was born on the station; 449, 450 and 451 came from Klipplaats; and the remainder from Aliwal North.

On the 27th March, 1907, Heifers 408, 409 and 422 were infested with brown nymphæ.

On the 27th March, 1907, 409 was reinfested.

On the 28th March, 1907, 433 was reinfested, and 404, 407, 412 and 420 infested.

On the 30th March, 1907, full engorged nymphæ dropped from heifers 408 and 409 and 422, and, on the 2nd April, 1907, from animals 404, 407, 412 and 420.

On the 4th April, 1907, Heifers 450, 451 were infested with brown nymphæ, and reinfested two days later.

On the same date 440 was infested, and 450, 451 and 440 were reinfested on the 9th April, 1907.

On the 10th April, 1907, Heifers 394, 398 and 435 were infested.

On the 12th April, 1907, and with the same brood, 439 was reinfested.

On the 13th April, 1907, reinfested 450, 451, 394, 398 and 435, and freshly infested 395, 402 and 405.

On the 15th April, 1907, reinfested 440.

On the 17th April, 1907, reinfested 435 and 439.

On the 18th April, 1907, reinfested 450.

On the 20th April, 1907, reinfested 451.

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On the 22nd April, 1907, reinfested 440.

On the 23rd April, 1907, reinfested 435, 439, 450, 451, and, on the 3rd June, 1907, 435 and 439.

On the 16th May, 1907, reinfested 418, 419 and 449.

None of these eighteen animals shewed a reaction consequent to the tick infestation, and, with the exception of 409 (*vide* Experiment 7F, killed on account of an accident), and 440 (*vide* Experiment 1D, died of Pleuro-pneumonia (lungsickness) are all still alive).

EXPERIMENT No. 9; with imagines (adult ticks) which, as larvæ and nymphæ had been feeding on healthy animals; the mothers of these imagines originated from sick animals.

N.B.—The mothers were collected in Durban on the 16th December, 1906, from animals suffering from East Coast fever. The larvæ had been feeding on animals Nos. 386, 395, 398, 402, 408, 409, 412, 420, 422, 401, 404, 407 and the nymphæ on the animals Nos. 394, 395, 398, 402, 404, 405, 407, 408, 409, 412, 420 and 422, and were collected from the 23rd March, 1907, up to the 22nd April, 1907, from these animals. The engorged nymphæ dropped from the 5th to the 30th May, 1907, and on the 27th May, 1907, the imagines (adult ticks) were placed on animals Nos. 446, 447, 450, 451, 452 and 454. On the 3rd June, 1907, all these heifers were reinfested with the same brood of imagines.

Heifer 446.—An irregular temperature reaction noted in this animal, and, on the 17th June, 1907, Piroplasma bigeminum (ordinary redwater) was seen. The animal is still alive.

Heifer 447.—Nothing noted in this animal. On the 8th July, 1907, infested with brown nymphæ which, as larvæ, had fed on Ox 387 suffering from East Coast fever. From the 25th July, 1907, fever was noticed, and, on the 10th August, 1907, this animal died of East Coast fever.

Heifer 450.—Nothing particular noticed in this animal, which is still alive.

Heifer 451.—Irregular reaction on the 6th July, 1907. Piroplasma bigeminum noted. The animal is still alive.

Heifer 452.—Nothing particular noted in this animal; still alive.

Heifer 454.—Nothing particular noted in this animal; still alive.

* * * *

RESUME.

1. The larvæ of the blue tick (Rhipicephalus decoloratus) which originated from females feeding on (*a*) animals suffering from East Coast fever, and (*b*) from animals immune to East Coast fever, did not transmit the disease.

2. The larvæ of Amblyomma hebræum (the bont tick) originating from mothers removed from sick cattle, and of the imagines (adult ticks) originating as nymphæ from sick cattle, did not transmit the disease.

3. All experiments to transmit the disease by means of the progeny (larvæ, nymphæ, and imagines or adults) of brown ticks whose mothers had been feeding on sick animals had no results notwithstanding the fact that the young ticks were kept for a considerable length of time before they were used for the experiments.

4. East Coast fever was transmitted (*a*) by the nymphæ of Rhipicephalus appendiculatus (the brown tick) which, as larvæ, had been feeding on animals suffering from East Coast fever, (*b*) by imagines of Rhipicephalus appendiculatus (the brown tick), evertsi (the red tick), and capensis (the Cape brown tick), all of which had infected themselves as nymphæ.

CONCLUSIONS.

Rhipicephalus decoloratus (the blue tick) and Amblyomma hebræum (the bont tick) must not be considered as hosts of Piroplasma parvum.

Rhipicephalus appendiculatus (the brown tick), evertsi (the red tick), capensis (the Cape brown tick), simus (the black-pitted tick), and, according to Lounsbury, also nitens (the shiny brown tick) must be considered to be hosts of Piroplasma parvum (East Coast fever). It may safely be concluded that Piroplasma parvum (East Coast fever), in its life cycle of development, does not pass through the tick's egg, and, finally, it is evident that immune animals do not carry the infection.

THE CHEMICAL SECTION.

NOTES FROM THE CHEMICAL LABORATORIES.

BY HERBERT INGLE, B.Sc., F.I.C.

The following analyses made during the past few weeks may prove of interest :—

GROUND NUT CAKE.

(Residue after expression of oil from pea-nuts) (*Arachis hypogæa*).

A sample of this product obtained from Lourenco Marques was found to contain :—

Moisture	7.86
Ash	4.42
Protein	49.00
Crude fibre	6.44
Oil	6.72
Soluble carbohydrates	25.56
	100.00

The ash included :—

Silica	0.30
Lime	0.29
Phosphorus pentoxide	1.32

The sample is somewhat richer in protein and carbohydrates, but slightly poorer in oil and moisture than the average American product.

Its high content in protein is noteworthy, and it would form a most useful addition to the food of animals which are fed on a ration consisting largely of carbonaceous foods, *e.g.*, mealies or oat-hay. As a source of material for bone formation, however, pea-nut cake, as shown by the composition of the ash, is not a good food, and is not comparable to lucerne or cow-pea hay.

WILD PLUMS.

A sample of this fruit, an illustration of which appeared in the *Journal*, Vol. IV., Plate LXXXI., has been examined with a view of determining its value as a possible source of oil.

The fruit was highly coloured, and the average weight was 6.92 grammes, or there would be about 65.6 fruits in the pound avoirdupois. The fruits consisted of :—

	Per cent.
Stones	21.3
Pulp, juice and skin	78.7

The "stones" had a thin shell and a large white kernel.

The whole stone (*i.e.*, shell and kernel together) contained :—

	Per cent.
Moisture	27.1
Oil	27.8

Or the "stones," if dried, would contain

38.1 per cent. of their weight of oil.

The quantity of material available would not permit of an examination of the oil itself, but it is probably similar to that yielded by the kernels of ordinary plums.

This has a specific gravity of 0.916 at 15 deg. C., and an iodine value of 100.4, and is usually classed as a non-drying oil. It is used chiefly to adulterate almond oil.

Pearl Millet (*Pennisetum spicatum*).

A sample of grain which it is claimed is an excellent food for ostriches has been examined for a correspondent.

The results were as follows:—

	Per cent.
Moisture	9.22
Ash	2.22
Protein	12.86
Crude fibre	2.14
Soluble carbohydrates	68.48
Oil	5.08
	100.00

The large proportion of protein and the small amount of crude fibre present show the material to be possessed of valuable feeding properties.

Neglecting digestibility, which, however, is probably high, the albuminoid ratio of the grain would be about 1 : 5.9, which is satisfactorily "narrow."

It would therefore be better adapted for the requirements of animals than foods in which the albuminoid ratio is "wide," *e.g.*, mealies, which has an albuminoid ratio of about 1 : 10.0. Such a food might, with advantage, if it is procurable at a cheap rate, be used to replace a portion of the too highly carbonaceous foods so often employed in feeding animals.

Sunflower Seed.

A sunflower head was received from Mr. S. Marks, of Zwartkoppies, for examination. It was about 12½ in. in diameter, but appeared to be not fully matured. It weighed 3 lb. 1½ oz., and yielded about 1970 seeds, which weighed about 9.4 oz., or 18.9 per cent. of its weight. The seeds were grey black, with white stripes, and about 3,360 went to the pound.

The seeds consisted of :—

	Per cent.
Husk	50.6
Kernels	49.4
	100.0

The kernels contained :—

	Per cent.
Moisture	18.8
Oil	33.2

The kernels, however, seemed to be hardly fully matured, and I am of opinion that, had the seed been more fully ripened, it would have yielded a higher proportion of oil.

As received, 100 lb. of seed would yield about 49 lb. of kernels, which would contain about 16 lb. of oil. In practice, probably only about 10 lb. would be extracted, *i.e.*, a little more than a gallon from 100 lb. of the original seeds.

Hungarian sunflower seed is said to yield about 45 to 55 per cent. of kernels, and the kernels to yield from 33 to 50 per cent. of their weight of oil.

Sunflower oil has a pleasant flavour, and is used in cookery. It is also employed for making soap and in the manufacture of varnishes. It is a drying oil, and is therefore not adapted for use as a lubricant. It has also been employed in the manufacture of margarine. The cake left after expressing the oil is rich in albuminoids, and furnishes a valuable cattle food. American analyses give as its average composition :—

	Per cent.
Moisture	10.8
Ash	6.7
Protein	32.8
Crude fibre	13.5
Soluble carbohydrates	27.1
Oil	9.1
	100.0

It would thus be very useful for "narrowing" the albuminal ratio of a diet consisting largely of carbonaceous foods, *e.g.*, mealies or oat-hay.

NITROGEN-FIXING ORGANISMS.

The "boom" in artificial preparation of cultures of these organisms and their application to soils or seeds in the growing of leguminous plants has recently been renewed.

It will be remembered that, as described in the *Journal* (Vol. III., p. 267, p. 525, and p. 725), cultures of the organisms were first put on the market about 1898 by Nobbe and Hiltner, but did not prove successful on the large scale. About 1903 modified cultures were prepared commercially in Germany by Hiltner, and in the United States of America by Moore, and most sensational articles on the importance and value of inoculation of seeds or soil with these preparations appeared in the popular Press. Many experiments carried out by the British Board of Agriculture, by the Canadian Government, and by others, however, failed to prove satisfactorily that any great advantage attended the methods. We obtained cultures of both the German and American preparations, and inoculated many parcels of seeds of beans, peas, and especially lucerne for farmers. With few exceptions, however, the effects of inoculation appears to have been but small, and only in one or two cases have the growers reported any marked advantages attending the use of the inoculated as against the untreated seed. Moreover, we have abundant evidence that without inoculation of either seed or soil, many leguminous plants develop the nodules on their roots, so that many of

our Transvaal soils already contain the nitrogen-fixing organisms. Consequently, the most that can be claimed for the process is that it ensures the presence of abundant organisms and the production of larger and more numerous nodules on the roots of leguminosæ than would be formed without inoculation.

Quite recently there has been, in England, a sensational attempt to revive the interest in this matter*, and in consequence we have received numerous applications for inoculation of lucerne seed. Within the last few weeks we have inoculated large quantities of seed for various correspondents. In every case we have advised the sowing, side by side, on carefully marked plots, inoculated and uninoculated seed of the same parcel, so that the effect, if any, may be ascertained by direct comparison.

But I would here repeat the caution, which I gave three years ago, that too much importance should not be attributed to the inoculation of seeds with these artificial cultures of nitrogen-fixing organisms. Under the best of conditions they can only make good the deficiencies of the soil in nitrogen.

Phosphates, potash, lime and other essential items of plant food must be supplied by the soil in adequate quantities, or full crops cannot be obtained. In this country, though deficiency in nitrogen is shown by many soils, the predominant needs of most crops are phosphoric acid and lime, and to supply these needs the most perfect forms of nitrogen-fixing organisms are quite powerless.

In some of the recent magazine articles on the subject, it is hinted that cultures which possess the power of forming nodules on the roots of *cereals* and other non-leguminous crops, and of there achieving the fixation of atmospheric nitrogen, have been prepared, and will probably be put on the market. While it would, perhaps, be rash to deny such a possibility, it certainly seems to the writer that the artificial production of such organisms is extremely improbable, seeing that, so far as is known, Nature herself has hitherto not succeeded in evolving micro-organisms possessed of these properties.

ABSTRACTS AND REVIEWS.

THE CHEMISTRY OF BORDEAUX MIXTURE.

By Spencer U. Pickering, M.A., F.R.S.

(*Journal of the Chemical Society, December, 1907, p. 1988.*)

This paper, though necessarily chemical in character, contains some valuable results which should be of interest to our readers.

The author points out that Bordeaux mixture has been in extensive use as a fungicide since 1883. The discovery of its value was accidental. In the neighbourhood of Bordeaux those vines which bordered a public road or footpath were often sprinkled with verdigris—a basic acetate of copper—in order to give them the appearance of having been poisoned, and thus discourage theft. A mixture of lime and copper sulphate was

* *e.g.* "Review of Reviews," Nov., Dec. and Jan. last.

substituted as being cheaper and answering the same purpose. When the downy mildew (*Peronospora viticola*) of America appeared in Europe it was noticed in 1882 that those vines which had been dressed with the copper mixture were much more resistant to the disease than the untreated vines. The mixture in general use is made by adding about 1 part by weight of lime made into "milk of lime" to a solution of 1.6 parts by weight of crystallised copper sulphate in 100 parts of water.

The reaction occurring has been hitherto generally represented as resulting in the formation of copper hydroxide.

Now, for complete precipitation of copper hydroxide one molecule of crystallised copper sulphate, $CuSO_4, 5H_2O$ would require one molecule of lime, CaO, *i.e.*, in weight, 249 parts of copper sulphate would require 56 parts of lime, *i.e.*, about one-fifth its weight. Obviously then, in practice, a large excess of lime is employed even after a liberal allowance for impurities in it.

Moreover, it is impossible that the precipitate in Bordeaux mixture consists of pure copper hydroxide, for that substance soon loses water, becoming black copper oxide, while Bordeaux mixture remains blue for an indefinite time. The author then investigated the composition of the precipitate formed in Bordeaux mixture. He found that it varied in composition, according to the relative amounts of the constituents employed.

In practice, where the lime is usually impure, the precipitate would consist of *basic* sulphates of copper and lime; with much lime it might have the composition—$10CuO, SO_3, 4CaO, SO_3$, if less real lime were used —$10CuO, SO_3, CaSO_4$, with still less lime the precipitate would approach in composition—$4CuO, SO_3$. By direct experiment the author showed that the composition of the precipitate formed by adding lime water to copper sulphate varied considerably in composition: with very small quantities of lime, the precipitate consisted mainly of a basic sulphate of copper—$4CuO, SO_3$, together with a little calcium sulphate—that as the lime increased the precipitate contained a more basic sulphate of copper—$5CuO, SO_3$, together with some calcium sulphate, with more lime a still more basic sulphate $10CuO, SO_3$, with more sulphate of lime was formed.

When the amount of lime exceeded one-fifth the weight of crystallised copper sulphate the precipitate contained this same basic sulphate, with calcium sulphate, and some free lime. Further, when the amount of real lime exceeded twice that of the copper sulphate present, the precipitate contained very little sulphuric acid. Lastly, when the amount of real lime exceeded five times the weight of the crystallised copper sulphate the precipitate contained no sulphuric acid, but consisted of a mixture of copper hydroxide and lime.

These various precipitates varied somewhat in colour. This variation is often exhibited in practice.

The fungicidal action of Bordeaux mixture is due to the slow liberation of copper sulphate (for it is really *soluble* copper salts that are possessed of fungicidal action) by the action of carbon dioxide upon the basic sulphate of copper.

The reactions would be:

$$4CuO, SO_3 + 3CO_2 = 3CuCO_3 + CuSO_4;$$
$$\text{or } 10CuO, SO_3 + 9CO_2 = 9CuCO_3 + CuSO_4:$$
$$\text{or } 10CuO, SO_3, 4CaO, SO_3 + 12CO_2 = 9CuCO_3 + 3CaSO + CuSO_4 + CaSO_4.$$

It is evident from the above equations that the first reaction is the most desirable to achieve in practice, since less carbon dioxide is required

(and the fungicidal action would therefore be more rapid), and one-fourth of the copper is again converted into the really active substance—copper sulphate.

The third reaction must take much longer to produce, and only one-tenth af the copper is obtained in the active form.

The author finds that "one part by weight of crystallised copper sulphate" (he must mean 1 gramme) requires 134c.c. of saturated lime water for the precipitation of the first substance—$4CuO, SO_3$.

To reduce this to a practical scale, it would appear that 1 lb. of crystallised sulphate of copper should be dissolved in about a gallon of water and mixed with 13½ gallons of clear, saturated lime water.

The resulting mixture is thus free from grit of undissolved lime and contains in suspension a precipitate consisting mainly of $4CuO, SO_3$, which when exposed to the air (*e.g.*, on foliage) absorbs carbon dioxide and slowly liberates copper sulphate which then acts as a fungicide.

The author claims that such a mixture would be rather more efficacious than a "normal" Bordeaux mixture, though it contains less than half the amount of copper, and is therefore less than half as costly.

NOTE.—The preparation of the suggested form of Bordeaux mixture requires great care, and since injury to foliage easily ensues if soluble sulphate of copper be present, it would be well to try the method on a small scale before spraying many trees with such a preparation.

The points raised by Professor Pickering are of much interest, but unless the greatest care were taken to ensure the lime water being really saturated, I fear there is considerable risk attending the practical carrying out of spraying operations on the large scale with such a preparation. Professor Pickering recommends that the absence of soluble copper from the mixture be assured by testing a filtered portion with potassium ferro-cyanide solution, which yields a brown precipitate or colouration when even so little as 0.002 per cent. of crystallised copper sulphate is present. Of course, if such a colouration be obtained, more lime water must be added. It may also be useful to point out the fact that a fungicide is merely a plant poison used in so dilute a form that the thin walled fungi are killed, while the thicker walled and more resistant host plant is able to withstand its action.

The facts elucidated by Professor Pickering's investigation render the action of Bordeaux mixture much more intelligible, while the practical application of them should lead to much economy in the somewhat expensive copper salt, and at the same time enhance the efficiency of the preparation as a fungicide.

HERBERT INGLE,
Chief Chemist.

THE CHEMISTRY OF MILK, WITH SOME PRACTICAL HINTS ON ITS TREATMENT.

BY R. D. WATT, M.A., B.Sc., N.DD., Assistant Chemist.

Milk is a natural secretion of the mammary glands or udder of the highest group of animals, called mammals, for the purpose of sustaining the life of their young. Of all mammals whose milk has been used for

human consumption the domestic cow is by far the most important, and it is the milk of that animal that will be exclusively dealt with in the present article.

Chemistry is the branch of science which deals with the composition of material substances and the changes which they undergo under varying conditions. Though milk was utilised as a food and manufactured into butter and cheese long before its composition and chemical properties were properly understood, still the science of chemistry and the allied one of bacteriology have been the means of making it more capable of preservation and of bringing its products to a higher and more uniform quality than was possible before. To the modern farmer and dairyman who desires to excel some knowledge of these two subjects, or at least of the light they throw on dairy problems, is absolutely essential. In what follows the writer has endeavoured to make clear some of the more important facts about dairy chemistry in the plainest possible language, so that even the most uninitiated may derive some benefit.

The composition of cow's milk as given by Richmond* as the average of 200,000 analyses is as follows :—

	Per cent.
Water	87.10
Fat	3.90
Milk-sugar	4.75
Casein	3.00
Albumin	0.40
Ash	0.75

In every hundred parts of milk there are, therefore, over 87 parts of water and only about one-eighth of it consists of nutritive substances. These latter are spoken of as the "solids" of milk, the most important being the fat. Milk, as is well known, varies very greatly in composition, especially the milk of individual cows. Other circumstances affecting its quality are the age, breed and food of the cow, the period of lactation (*i.e.*, the time since calving), and the length of the interval between milkings. The most variable constituent is the fat, samples having been analysed which contained as little as 1.4 per cent., and as much as 12.5 per cent. of that ingredient. The "solids not fat" are fairly constant, but even these have been found to vary from 4.92 per cent. to 10.6 per cent. These extreme cases are only possible in the milk of individual cows. When the milk of a whole herd of cows is mixed it rarely happens that the fat falls below 2.75 per cent. or the "solids not fat" below 8 per cent. It will thus be seen that the milk of individual cows varies very greatly in value, especially where butter or cheese is made.

* * * *

The milking qualities of an animal—both as regards quantity and quality—are to a large extent hereditary, and in progressive dairy countries great attention is at present being paid to breeding only from such animals as give a large yield of milk of good quality.

The keeping of milk records is becoming a matter of importance, and where the milk of each cow is weighed at every milking and the percentage of fat determined from time to time, the progeny of the cows giving the

* Richmond's Dairy Chemistry, p. 120.

best results are in great demand and command high prices. A very good example of this was brought to light at the recent Dairy Conference at The Hague. A Dutch farmer was interviewed who in ten years had raised the standard of butter fat in his herd of Friesland cows (a breed more noted for quantity of milk than for quality) from 3.10 per cent. to 3.55 per cent. by careful breeding and judicious selection. He further stated that he had sold for £90 a cow whose milk on analysis showed an average of 3.81 per cent. of fat. A bull of the same breed has recently been sold in the United States by public auction for £1,600. His dam had a record of 1,900 gallons per annum.

We shall now briefly consider each of the constituents of milk separately.

(1) Little need be said about the *water* except that there is enough of it in milk to make a further addition by the milk-seller quite unnecessary.

(2) *Milk fat or butter fat* is perhaps the most palatable and digestible of all the important group of substances to which it belongs. Its chemical composition is rather complicated, and it is only necessary to state that it contains the three elements—carbon, hydrogen and oxygen—and that it can be distinguished by chemical means from the cheaper and commoner animal and vegetable fats, of which butter substitutes, such as margarine, are chiefly composed. It exists in milk in the form of very, very small drops or globules, which gradually rise to the surface on standing, forming a layer of cream. As a food the chief function of fat is the production of heat and vital energy, though it is also capable of building up fatty tissue.

(3) *Milk-sugar* is similar in its composition and properties to ordinary cane-sugar, though it is not nearly so sweet. It also contains the three elements, carbon, hydrogen and oxygen only, and its function as a food is similar to that of the fat, though it is not nearly so valuable a producer of heat and energy. It is to this substance that fresh milk owes its sweetness, and to its decomposition by bacteria into lactic acid that stale milk owes its sourness.

(4) and (5) *Casein and albumin* belong to the group of bodies known as proteids or albuminoids. In addition to carbon, hydrogen and oxygen, they contain the important element nitrogen, as well as small quantities of sulphur and phosphorus. They are the only constituents of milk which are capable of forming muscle and similar tissue. The albumin is present in the dissolved state, just like milk-sugar, whilst some of the casein is in a state of solid suspension combined with certain of the ash constituents. Both of these substances somewhat resemble white of egg in composition. Albumin, like white of egg, is coagulated or thickened on heating—a fact which gives rise to the trouble often experienced in cleaning out a vessel in which milk has been boiled. Casein is not coagulated by heat under ordinary pressure, but is curdled by rennet, as in cheese-making, and also by acids, such as lactic acid.

(6) The *ash* of milk is that portion which remains when milk is ignited or burned. Its chief constituents are common salt, the chlorides and phosphates of potash and phosphate of lime, which is so important in bone formation.

One would naturally expect milk to be a perfect food, at least for the young animal, and from what has been said it is evident that it contains

the ingredients necessary for the formation of every kind of animal tissue as well as those which supply the required heat and energy for life. Its value for human consumption can hardly be over-estimated, as there is no other single food which contains all the elements required for nutrition in the proper proportions and in a palatable and digestible form. The chief objection to its use is that it will only keep in a fresh condition for a comparatively short time. The difficulty of preserving milk is specially felt in a warm climate such as that of the Transvaal, so that a brief discussion of the methods used for its preservation should prove helpful.

Before one can cure a malady or defect one must know its cause. What, then, is the cause of milk going bad or turning sour? Most people are familiar nowadays with the fact that bacteria, or "germs" or "microbes," play some part in producing disease. These small, unseen foes have a good deal to answer for, and amongst the crimes laid to their charge they have to plead guilty to causing the souring and curdling of milk. Before going further it will be necessary to have some understanding of the nature of micro-organisms, especially bacteria. The term "micro-organism" is applied to any form of living being which is so small that it is invisible to the naked eye. *Bacteria*, though popularly supposed to be minute animals, really belong to the plant or vegetable kingdom. Each consists of a single cell made up of protoplasm or living matter surrounded by a cell-wall. In shape they are either round like a ball or in the form of a straight or curved rod. They vary in size from about 1-25,000th of an inch in diameter to several times that size. A thousand millions of them could, therefore, be packed into a hollow cube with edges 1-25th of an inch long.

About 200 different kinds of bacteria have been found in milk. It must not be thought that all of these are necessarily harmful. If milk could be kept perfectly free from germs, however, it would keep for a very long time without going wrong. Every precaution should therefore be taken to prevent their entrance into milk. . . . How, then, do microbes get into milk? It has been proved conclusively that unless the udder is diseased, the milk which it contains is absolutely free from microbes, and yet in freshly-drawn milk as many as 56 millions per pint have been found. First of all, then, they may get into milk from the air, which is never entirely free from "germs." The number varies from eight per cubic yard on a mountain top to 400,000 per cubic yard in places where dust is stirred up, as in sweeping a room. In many badly ventilated and badly lighted cowsheds the number cannot be very much less than this latter alarming number. Other sources of contamination are the hands of the milker and pieces of dirt which drop into the milk from the belly, udder and tail of the cow. Very often, too, the milk pails and cans are washed with water rich in bacteria. Besides this, the first-drawn milk invariably contains a large number of micro-organisms. This is due to the fact that a little milk generally remains in the teat from the previous milking. This is not completely shut off from the air, and gets infected by bacteria, which multiply enormously in the intervals between milkings.

The remedies for these defects are obvious. The cowshed should be well ventilated and lighted. Its floor and walls should be made of some material which can be easily cleaned. The hands of the milker should be thoroughly washed before milking each cow, and the cows themselves

should be kept as clean as possible. As a further precaution, the first few "strones" from each teat may be rejected or milked into a separate dish. The milking pails and cans should be thoroughly steamed or scalded at least once a day, and the milk should be removed from the cowshed immediately after milking and thoroughly strained and cooled. Attention to these little details will very considerably lessen the number of bacteria present in milk, and consequently increase its keeping qualities, and render it a much better raw material for the manufacture of butter and cheese.

A common source of contamination with disease-producing bacteria is the water in which the milk pails are washed, and it is thus that the germs of that dreaded disease of this country—enteric fever—get into our milk supplies. Again, if a person suffering from scarlet fever, or coming in close contact with a scarlet fever patient, takes any part in the dairy operations, the germs may get into the milk. These may be considered as two typical cases. The remedy for the first is the proper steaming or scalding of all dairy utensils; and for the second the proper isolation of all sufferers from scarlet fever and similar diseases.

When, however, every precaution has been taken to keep milk pure it will be found to contain numerous bacteria, and it now becomes necessary to consider how they can be destroyed or their activity impaired. Bacteria of all kinds are very much affected by changes of temperature, and herein lies the weak point in their armour. Milk when drawn from the udder is at a temperature of about 97 deg. F., and this is precisely the temperature at which milk bacteria flourish to the greatest extent. If milk is cooled down immediately after milking and kept at a low temperature, the vitality of the micro-organisms is considerably reduced, their power of multiplication impaired, and many may be killed outright. This can be easily effected by means of a cold water cooler or refrigerator, by means of which the milk can be cooled down to very near the temperature of the circulating water. Many interesting experiments have been carried out to show the effect of temperature on milk bacteria. The following will serve as an example:—"It was found that after fifteen hours at 59 deg. F. a sample of milk contained 100,000 bacteria per cubic centimetre, while the same milk kept at 77 deg. F. contained 72,000,000 per cubic centimetre."

* * * *

A much more effective means of preserving milk is to raise the temperature instead of lowering it. When milk is boiled all the adult bacteria are killed off as well as many of the spores, and it is thus rendered practically safe. As many people object to the cooked flavour of boiled milk a less drastic, if somewhat less effective, method is frequently adopted, known as *Pasteurization*. This consists in heating milk to a temperature of 158 deg. F., and then cooling it rapidly. This is the highest temperature to which milk can be heated without affecting its composition or flavour, and it is sufficiently high to kill all the adult bacteria and to render it safe in most cases.

Still another method of preserving milk is the use of preservatives in the shape of chemical substances which are hurtful or poisonous to bacteria. The following have been used:—

(1) *Salicylic acid* is one of the most successful in improving the keeping qualities of milk. It also kills many disease germs, though it

has little effect on others. If present in quantities greater than a mere trace it imparts a disagreeable taste to milk, and most doctors agree that it is injurious to health.

(2) *Borax and boracic acid* assist the keeping qualities of milk, but have little effect on disease germs. Besides, their repeated use is injurious to young children, if not also to adults.

(3) *Quicklime* might be expected to be a useful preservative owing to its power of destroying disease germs and of neutralising lactic acid. But in milk it is really ineffective, as it is readily converted into inactive compounds.

(4) *Carbonate of soda and bi-carbonate of soda* have the effect of neutralising the lactic acid produced by bacteria, so that milk thus treated does not get sour or curdle so quickly as untreated milk. They do not kill disease germs, however, and actually favour the development of some kinds.

(5) *Hydrogen per-oxide* is an effective preservative, but the commercial article usually contains barium chloride, which is poisonous.

(6) *Formaldehyde* or *formalin* is fairly effective, but has the effect of rendering the casein of milk indigestible.

Taking these facts into consideration, the use of chemical preservatives is *not* to be recommended, and the prohibition of their use by the municipalities of Johannesburg and Pretoria is quite justifiable.

Besides causing the souring and curdling of milk, bacteria are responsible for bringing about certain curious effects in somewhat rare instances. Thus they have been known to produce various colours in milk. For example, a number of different organisms have been isolated which have the power of producing red colours of various tints—not to be confused with "bloody" milk, which is due to a diseased or injured udder. Blue and yellow colours have also been known to have a similar origin. The bitter taste sometimes met with in milk is frequently due to bacteria, though it may in some cases be caused by the feeding. Milk sometimes acquires a soapy taste, which is said to be the work of bacteria often found in the straw used as litter. A still more curious result caused by bacteria associated with certain plants (*e.g.*, butterwort) is the production of "stringy" milk, *i.e.*, milk of a sticky consistency which is often so marked that the liquid can be drawn out into long threads if a finger be dipped into it and slowly raised.

SUMMARY.

(1) Milk is a complete food.

(2) The chief objections to its use are its lack of keeping qualities and its power of transmitting disease.

(3) Both of these defects are due to bacteria or "microbes."

(4) Every effort should therefore be made to keep bacteria out of milk by observing the greatest cleanliness in its treatment throughout.

(5) Pasteurization—heating to about 158 deg. F. and then rapidly cooling—is the best means of preserving milk.

(6) Where this is not practicable the milk should be cooled immediately after milking, kept as cool as possible, and out of contact with the air.

(7) Boiling milk is an almost certain safeguard against contracting disease from it.

(8) The use of chemical preservatives is not to be recommended.

MANGANESE COMPOUNDS AS FERTILISERS FOR MAIZE.

By W. F. Sutherst, Ph.D., F.I.C.
(Agricultural Department, Marist Bros. College, Uitenhage.)

Some years ago reports from Japanese experimental stations came out about the good effects of manganese on certain crops, and latterly in Holland the matter has been taken up more thoroughly, and so far the results have been most favourable. Manganese is widely distributed in the soil, and most plant ashes contain a good percentage of it, especially is this the case in forest trees, in which iron is present in about the same quantity.

Whether it occurs in these plants as accidental or a necessity, and the reason for its presence, is not yet fully known. So far it has been explained that the good effects are more or less of a tonic nature, such as small doses of arsenic have been known to exert on certain crops. A recent report from the Groningen Experimental Station (Holland) shows that certain plant diseases have been cured by using manganese salts as fertilisers, and, in consequence, much larger crop yields obtained. So far this is only a theory, and needs further work for absolute proof.

As maize has been spoken of as answering best to manganese fertilisers, trials were carried out here to see if such effects could be obtained under our conditions of climate and soil. To be absolutely under control, pot experiments were tried, each pot being about 3 ft. high, with an area of about 1 square yard. A quantity of soil was thoroughly mixed, and each pot filled under like conditions; holes were made about 2 in. from the bottom, so as to allow excess water to drain out; but the 2 in. of soil below the holes being constantly wet, kept the pot from being absolutely dry in case of great evaporation. In pot No. I. 2 grammes (30 grains) of chloride of manganese were dissolved in water and sprinkled on the soil; in No. II., 5 grammes of the black oxide of manganese (*pyrolusite*) were thoroughly mixed with the first 6 in.; in No. III., 2 grammes of manganese sulphate; and in No. IV. no manganese was placed.

In order to get a thoroughly representative growth in such a small space, about 20 seeds of equal weight were planted in each pot, and when a certain size had been reached, about 10 of irregular growth removed. Later on this process was repeated till one only remained, and was allowed to reach the height when photographed.

From the accompanying Plate, it will be seen that pyrolusite, which, by the way, occurs in such large quantities in South Africa, gave by far the best result, a remarkably healthy plant being produced. No. I., grown with chloride of manganese, also shows considerable improvement in size and quality. No. III. did not give such a result as expected, but the quality is far better than No. IV., containing no manganese. (Plate 38.)

Of course, absolute reliance cannot be placed in one trial only, but next year the work will be repeated on a far larger scale, and on the ground itself.

Note on Manganese Compounds as a Manure.

Although from the experiments of Katayama, Nagaoko and others, there can be little doubt that small additions of manganese salts to soils often produce a considerable increase in crop, especially in leguminous ones,*

* In the case of peas the former investigator found an increase of 50 per cent. in the straw and 25 per cent. in the seed by the addition of ·015 per cent. of manganese sulphate to the soil, while with barley the total increase was only 10 per cent.

Salomone has shown that large amounts are decidedly injurious, and that manganic salts are much more injurious than manganous.

Experiments at Woburn have shown considerable benefit by soaking seed wheat in a solution of manganese sulphate containing less than 2 per cent of the salt before sowing, while barley obtained no advantage by such soaking. Both crops, however, were improved by the addition to the soil of about 50 or 60 lbs. of manganese sulphate per acre.

The Japanese experimenter, Nagaoko, found that with rice up to 80 or 90 lbs. per acre of manganese sulphate was beneficial. In Dr. Sutherst's experiment the dressings employed would correspond to approximately 22 lbs. of manganese chloride and manganous sulphate, and about 55 lbs. manganese dioxide per acre. These quantities are apparently somewhat lower than previous investigators had found the most beneficial. With reference to this point, I may mention that I have found appreciable quantities of manganese in several samples of the so-called "bats' guano" from caves in the dolomite.

As to the method by which manganese compounds act upon plants, I have little to add to what Dr. Sutherst has stated. It appears probable that its effects are very similar to those of ferrous sulphate ("green vitriol"), small dressings (say 56 lbs. per acre), of which have long been known to have a decidedly beneficial effect upon many crops. This is apparently due to an increase of chlorophyll production in the plant, though Griffiths adduced evidence that the iron enabled the plants to develop without such large amounts of potash compounds as they would otherwise require.

For the present it will be safer to assume that manganese exerts a "tonic" action, but its application to a soil must not be regarded as at all an efficient substitute for the plant food required and usually supplied in commercial manures.

In other words, it is probably better regarded as a medicine than as a food.

HERBERT INGLE,
Chief Chemist.

Plate 38.

No. 1.	No. 2	No. 3.	No. 4.
2 grams.	5 grams.	2 grams.	No
Manganese	Manganese	Manganese	Manganese.
Chloride.	Dioxide.	Sulphate.	

Effect of Manganese Compounds on Maize.

Plate 39. **The Silver Wattle.**

(*Ac. decurrens var. dealbata.*)

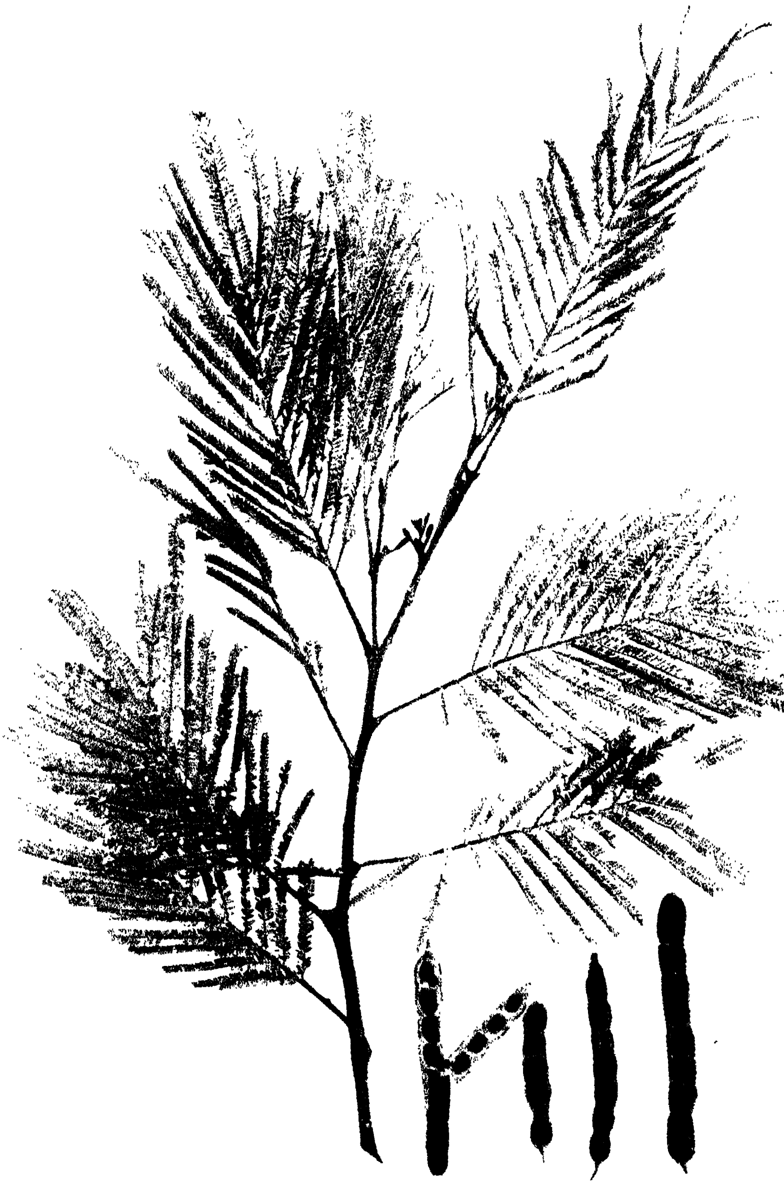


Plate 10. **The Black Wattle.**

(*Ac. decurrens var. mollis. Ac. mollissima. Willd.*)

Plate 41. **The Green Wattle.**
(*Ac. decurrens var. normalis.*)

THE FORESTRY SECTION.

THE THREE COMMON VARIETIES OF THE FEATHER-LEAVED WATTLES.

BY C. E. LEGAT, B.Sc., Conservator of Forests.

Apart from purely ornamental wattles, such as Ac. Baileyana, there are three kinds of feather-leaved wattles which I have come across under cultivation in the Transvaal. At present there is considerable confusion in regard to their nomenclature and characteristics which it is the purpose of this article to dispel.

The common names of these wattles are :—

(1) Silver or blue wattle,
(2) Black wattle,
(3) Green wattle,

though in practice I find these designations somewhat loosely applied and recklessly interchanged, so that it is sometimes difficult to know in the absence of specimens exactly what variety people refer to in conversation or correspondence.

Maiden, the Australian botanist, who has studied wattles carefully, has come to the conclusion that all the above-mentioned kinds are merely varieties of Ac. decurrens (Willd.), and designates them botanically as under :—

(1) Acacia decurrens var. dealbata,
(2) Acacia decurrens var. mollis.,
(3) Acacia decurrens var. normalis.

An earlier botanist than Maiden considered No. 2 a distinct species, and called it Ac. mollissima, which is the name it is commonly known by among all South African nurserymen.

By referring to Plates Nos. 39, 40, and 41, it will be seen there is not any very marked difference in the foliage of the black (*Ac. decurrens var. mollis.*) and the silver wattles (*Ac. decurrens var. dealbata*), but that green wattle, on account of the length of its leaflets and the space between them, is quite distinct from either.

There is, however, no difficulty in distinguishing between Ac. decurrens var. dealbata and Ac. decurrens var. mollis. if it is remembered that the former has a silvery or blue foilage, that it flowers in winter (about August), that its flowers are golden in colour, and that the seed matures in about six months from date of flowering, whereas the latter has very dark green foliage, flowers in early summer, and has sulphur-coloured blossoms which produce seed about a twelvemonth later.

* * * *

In Australia Maiden states that the time of flowering is not an absolute criterion as to the variety, but here it is a safe guide in distinguishing between silver and black wattles.

In speaking of the flowering period, I refer to the time when the trees as a whole are in blossom, and exclude the occasions when they carry a few

stray flowers, which they may do over a considerable portion of the year. The black wattle is the one which is so extensively cultivated in Natal for the production of the tannin yielded by its bark.

It is not so hardy against frost as silver or green wattle, and there are many parts of the High Veld where these latter varieties will stand and black wattle will not. For example, during last winter, which was exceptionally severe, green wattles on Mr. A. A. Struben's farm at Nooitgedacht, near Machadodorp, were not injured at all by the cold, while black wattles were badly cut back. Both kinds were planted before the war, and were, therefore, well established.

* * * *

In the summer of 1906—1907, Mr. J. Forbes, of Athole, sowed a mixture of green and black wattle on his farm Tolderia, Lake Chrissie district, and found that as a result of the frost the following winter, his black wattles were killed to the ground, and the green wattles were only slightly affected at the tips.

Samples of green wattle and black wattle bark grown in the same neighbourhood, viz., Pilgrims Rest, which have been analysed by Mr. H. Ingle, the Chief Chemist of this Department, have given the following results :—

	Green. Per cent.	Black. Per cent.
Total soluble extract	45.07	47.09
Tanning matter	29.87	30.61
Non-tanning matter	15.20	16.48

As far as tannin production goes, there is therefore very little to choose between the two varieties, though no safe deduction can be made from a single comparative analysis of this sort.

If a series of analyses confirms the result obtained, it would appear advisable to grow the green wattle in the Transvaal in preference to the black, at any rate in localities where there is a possibility of frost being severe enough to affect the latter, though it must be borne in mind the yield of green wattle bark per acre is not so great as that of black.

Silver wattle bark gives a much smaller percentage of tannin than the other two, and the tree is therefore only cultivated for shelter belts, fuel and poles.

Where green and black wattle stand in plantations side by side, as at Athole, Amsterdam, it is noticeable what a much cleaner, straighter stem the former makes, and it is also remarkable how much more strongly it reproduces itself from seed. Green, like silver wattle, flowers in winter, and it far surpasses the other two varieties in the wealth and beauty of its flowers, which are of a rich golden colour, and for ornamental planting it should certainly be preferred to the other two. Its relative hardiness as compared with silver wattle has not yet been definitely ascertained, but there are indications that there is very little difference between them in that respect. Green wattle seed is scarce at present, but small quantities, not exceeding ¼ lb. in weight, will be issued on application to farmers for trial. The cost will be 1d. per oz., postage extra.

It will, of course, not be possible to sow the seed before next summer, but ground should be prepared now.

THE BOTANICAL SECTION.

HOW TO SECURE GOOD SEED-MAIZE.

By Joseph Burtt-Davy, F.L.S., Government Botanist.

The Demand for Good Seed.

To obtain heavy crops of good maize three things are requisite: (1) proper preparation of the soil, (2) high-grade seed, and (3) frequent cultivation.

There is a growing demand among farmers for seed-maize of good quality; this is shewn by the number of enquiries we receive as to where the best qualities can be obtained. It is also recognised by leading farmers that it pays to give good prices for good seed, and there is no difficulty in disposing of it at 20s. and 25s. per muid. The American farmer is even more keen: he pays 40s. to 70s. per muid for really well-bred seed.

This Department has been approached recently with a view to importing such seed from America for sale to farmers. It is not desirable to use bulk lots of American seed-maize for several reasons. Of these I need only mention three: (1) The seed is apt

to deteriorate in transit; (2) the American harvest takes place at about the commencement of our spring season, so we could only obtain year-old seed; (3) as the maize-plant is peculiarly sensitive to climate and soil it takes two or three years for imported seed to become acclimatised, and by that time it would begin to deteriorate unless more than the ordinary care was given to it. Professor Hartley, an eminent American authority on maize-breeding, writes that because of differences in soil, climate and length of growing season, a maize improved in one locality does not afford the best seed for localities which are unlike it.

An Opportunity for Enterprising Farmers.

It is impossible at the present time to meet the local demand for well-bred Transvaal-grown seed-maize of the best quality, but there is no reason why we should not grow as good a quality here as is produced in America, or nearer home in Natal, and in sufficient quantity to supply every farmer in the country.

The demand for good seed at good prices offers a fresh source of income to farmers who know how to produce it. But it requires skill, knowledge, and care, and it is only the well-trained farmer who will be able to grow maize suitable for seed purposes. The average farmer who has not the requisite training will find it more profitable to buy well-bred seed from the man who knows how at even 20s. to 30s. per muid than to attempt to grow it for himself. To supply the whole of the Transvaal a large quantity would be required, so there is ample scope for the enterprising farmer. Each part of the country having climate and soils differing from those of other districts should grow its own seed-maize bred from improved local strains or from improved varieties which have become acclimatised after being imported from other districts.

Good Seed-Maize must be Well Bred.

The demand for good seed has shewn itself in the efforts of the more enterprising farmers to select their own by picking out the biggest ears at harvest time, or by buying prize bags at agricultural shows. This is better than no selection, but the practical farmer soon sees that it brings him to a certain point *but no farther*. Why is this, and what more can be done? There are two good reasons: (1) A prize bag of maize may have been sifted from a bulk lot of very indifferent grain, and the largest grains are often produced on poor, ill-formed ears, giving a small yield per acre. These poor ears reproduce, to some extent at least, their own characters. It is well to remember that a large grain does not necessarily produce a good ear and a good yield, though good ears will generally reproduce good ears if they have not been crossed with poor ones.

(2) The big ears, picked out at harvest, are more likely to reproduce their kind than shelled bags of large heavy sifted seed picked up at shows or merchants' stores. But, in an ordinary field of maize, the proportion of typically good ears is very small. I recently went carefully through fifteen acres of what appeared to be a fine crop of maize, running probably eighteen bags to the morgen. In the course of about an hour I could find only two plants which could be considered ideal for seed purposes! And this was not the

ordinary crop of the country, but much above the average! I could not find 100 plants in an acre that were worth picking for seed, and an acre carries at least 8,000 plants. At this rate there would be 80 poor plants to every good one, and as the maize plant is subject to cross-pollination, it is evident that every good plant is almost certain to have been crossed with one or more of the many poor plants with which it was surrounded: *deterioration in the quality of the seed must follow.* This deterioration would not show in the ear produced this year, but *it will show in the next crop*, and this explains why deterioration is constantly taking place where breeding is not practised.

I propose now briefly to answer the question offered above: what more can be done?

* * * *

Plant-Breeding.

What do we mean by plant-breeding? The principles followed in the breeding of plants are much the same as in the case of animals—horses, cattle, sheep, pigs or poultry. The fundamental point is the determination of the ideal type and the constant selection of those male and female parents which approach that type as closely as possible.

In the breeding of plants three principal methods are employed: hybridisation, cross-fertilisation and selection. Of these, selection occupies the most prominent place in general practice.

The strict definition of the term *hybridisation* implies breeding from two parent plants belonging to different species or even genera, as, for instance, between wheat and rye. It is but little practised in the improvement of farm crops, and need not be further discussed here.

By *cross-fertilisation* we mean inter-breeding between plants of different "varieties" or "races" of the same species, as between two kinds of maize. This will be discussed more fully a little further on.

Selection.

Selection may be roughly defined as the choice of suitable parents for the production of seed of the desired type, even when they belong to the same variety or race, for example, two parent plants of "Hickory King." Selection implies that there must be characters to choose from. Before outlining the method of breeding seed-maize, it will be well to mention the most important characters of a good type.

Early Maturity.

An important point for consideration in the Transvaal is early maturity. On the High Veld thousands of bags of maize are spoiled each year by early autumn frosts; last season was an exception in this respect. Deep ploughing and early sowing reduce the risk of loss from early frost, but, with every precaution in this direction, there is still need for early-maturing sorts which can be sown after the last date for sowing the late-maturing crops, and, in this way, increasing the total acreage for the season.

Unfortunately for our purposes, early maturity is generally correlated with light yield. We are trying to correct this, and expect to be able to do so in due course, but it is likely to be a difficult and slow process.

Heavy Yield per Acre.

With increased production, local prices cannot be expected to remain high. The price obtainable oversea is regulated by the size of the crops in North and South America, S.E. Europe and Egypt. Many Transvaal farmers complain that it does not pay to grow maize; that it is not a white man's crop. Many others, however, grow maize at a comfortable profit; wherein lies the difference? It is not altogether in distance from railway or market, but is mainly due to *difference in yield per acre.* One man harvests two muids per acre, and another twelve muids; the cost of ploughing and sowing is about the same in each case; it costs rather more to harvest twelve muids than two, but the general total cost of production is nearly the same. At 8s. per muid one man gets 16s. per acre for his crop, and the other 96s. per acre; one says farming does not pay, the other is well pleased with his results.

It is possible that with increased production the price will fall still lower than at present; the man who grows only two bags will then stop growing, except for his own home use, and the man who grows twelve bags per acre will find it necessary to grow still more on the same area. A farmer told me the other day that he did not think it possible to grow more than an average of 10 bags per acre (20 per morgen). But I know Transvaal farmers who, last year, grew 19 bags per acre as the average over 20 acres of ground. Hartley states that good farmers frequently grow from 75 to 100 bushels of maize per acre. An American bushel of maize on the cob weighs 70 lbs; 75 bushels to 100 bushels would, therefore, be equivalent to 26 to 35 muid bags per acre. An American bushel of shelled maize must weigh (by statute) 56 lbs., which would be equivalent to 21 to 28 muid bags per acre. Maximum yields are, of course, higher. He adds that a Pennsylvania farmer has been known to harvest no less than 100 bushels (23 muids) per acre during twelve successive years (excepting only two seasons), and that, in 1902, his average yield over 90 acres was 130 bushels or 36.4 muids. Our Transvaal records are pretty good, for, at Tzaneen, this Department has grown 35½ muids (127 bushels of shelled maize) per acre of Austin's Colossal Yellow Dent, and at the Experiment Farm, Potchefstroom, 33½ muids (120 bushels) of a white dent.

This being the case there seems no reason why, given proper treatment of the crop, and with heavy-yielding varieties and well-bred seed, good farmers in the Transvaal should not raise an average of 20 muids (71 bushels) per acre; it is an ideal worth working for!

Correlation of Characters.

It is well known among breeders both of plants and animals that certain characters are more or less related to each other in certain individuals, and are inherited together. When a certain character is present in an individual, one is almost certain to find another

character present which is correlated with it. These correlations may be of several kinds; Webber divides them into four groups, which he has termed Environmental, Morphological, Physiological and Coherital.

It is of great practical importance to the breeder to understand these correlations, for reasons which space will not allow us to discuss now. Suffice it to say that it is essential to a proper selection of parent plants that we should not only pick out those bearing good ears, but that, in addition, we must study the habit of growth of the plant, its stem, leaf and flowers. These have an important influence on the production of good grain.

Desirable Stalks.

The stalk represents the individual plant, and corresponds to the individual animal, the form and size of which are so carefully selected by stock-breeders.

For a grain-maize (*i.e.*, not considering the question of ensilage), a desirable stalk should have no suckers or off-shoots, should have well-developed roots, be thick at the base and gradually tapering to the top, and bear a good ear; this should be a little below the middle point to reduce the danger of blowing down in a strong wind. For the same reason the stalk should not be too high; even in the Low Veld it is doubtful whether a height of more than 5 feet is desirable.

Leaves.

To produce the large amount of starch which is stored in a full ear, a large leaf is necessary; 14 to 16 blades is a desirable number, and, on well-grown plants, the blade of the middle leaf should be from 4 in. to 6 in. across.

Ears.

The shank of the ear should not be more than 4 in. or 5 in. long; some varieties and strains produce shanks of 9 in. to 12 in., which is a most undesirable character.

An ear of cylindrical shape, well rounded at each end, gives the largest percentage of grain to cob; its kernels are also more uniform in shape. The cob should not be too large, nor yet too small, and it is a mistake to suppose that the thinnest cob possible is the most desirable; a fairly large cob will carry more grains than a very slender one. A more important point is the property of drying quickly and well, causing it to be of light weight and a bright, healthy colour; the number of rows should be uniform (8, 10, 12, etc.); the rows should be straight and with little space between; the grains should fit together compactly and be firm on the cob, and should be uniform in shape and length on all parts of the ear. A well-developed cob of Minnesota No. 13, one of the best bred varieties in the States, is shewn on Plate 42.

I have heard many farmers suggest that it would be desirable to save seed from plants bearing two or three ears in order to develop a more productive race. Experience shows, however, that with most varieties it is preferable to grow one good ear per plant than two medium or poor ones; few plants seem able to develop two really good ears, and much effort is wasted in the attempt which might better be devoted to the production of one good ear.

Some local varieties show strong tendency for the sheath of the ear not to cover the end of the cob well. This is a bad defect, and should be bred out. It leaves the uppermost ovules and silks exposed to weather and insects, and badly filled ends result.

The most desirable character of a seed-ear is its power to reproduce abundantly a good quality of ears, but this can only be finally determined by comparative growing tests.

Desirable Grains.

To again quote Professor Hartley: "Length is a very desirable character for the grains of maize to possess, as it is by increased length in proportion to the diameter of cob that the percentage of grain is increased. Soft, chaffy grains, though long, or grains with prolonged chaffy caps, are not desired. It is much better to select for increased length of kernel than to select for small cob. Selecting for small cob results in reducing the size of the ear, and it is also an easy matter to reduce the size of the cob to such an extent that the pressure of the kernels causes the ear to break." The most desirable shape of grain, he adds, is that of a wedge having straight sides and edges. This shape admits of the kernels fitting together so compactly that little or no space is wasted. The germ, the most nutritious portion, and the portion in which is located the embryo plant, should be large, smooth and firm.

I am aware that this American ideal excludes such broad types of grain as the Natal "Hickory King," and I am also aware that, to-day, "Hickory King" is considered one of the best selling types on the local market. But it does not necessarily follow that "Hickory King" is the most profitable type to grow. We need further information on several points in this connection before we can form a definite opinion as to the variety that will pay best. If we can get the best price, combined with good yield, from the broad "Hickory King," that may be the best type for us to grow. But if we get, say, 10s. a muid for "Hickory King," yielding 12 muids per acre, and only 9s. per muid for some other variety yielding 15 muids per acre, it will pay better to grow the 9s. variety, for it will sell for 15s. per acre (or £7 10s. per ten acres) more than the "Hickory King."

* * * *

The Method Followed in Breeding and Selection.

The first point to decide is the variety to be grown, for, as it takes some years to perfect a strain, it is desirable to select the one that is to be grown for an indefinite period. Owing to the fact that the pollen of one variety will cross-fertilize ("bastard") another variety growing within 400 yards of it, it is desirable to grow not more varieties than can be kept so far apart from each other. During the past five years a great many of the principal varieties have been grown all over the country, and some ideas have been formed as to the sorts best suited to the district and the particular soil on the farm.

Selection of Parent Ears.

The strain having been chosen, it is necessary to fix in mind the ideal stalk, leaf, cob and shank, and to select 100 or more plants which come as close as possible to that type; these should be marked

conspicuously so that they will be found at harvest time. A field of from 15 acres to 30 acres should be chosen for selection. The time when the selection is made will depend partly on the object sought; if this be early maturity it will be desirable to go through the field when the *first tassels and silks* appear, marking all the earliest plants, provided they are desirable from other points of view. It will also be desirable to repeat the process when the first plants begin to ripen, because it does not seem to be the case that the earliest plants to flower are always the earliest to mature; this point needs further investigation, however. For ordinary selection for yield and quality the best time is probably when the ears are well-developed, and before the leaves have turned brown; at this stage the breadth and colour of the leaf can be observed to good advantage. Each selected plant should be marked with a conspicuous white label which will not be lost sight of when the leaves turn brown at harvest.

The ears should be allowed to ripen well on the stalks; the stalks of the selected plants might be harvested and stooked by themselves to avoid delaying the rest of the harvest. When thoroughly dry, careful selection of the ears must be made, only 40 or 50 of those which come closest to the ideal being retained for the breeding plot. These should be weighed separately, when quite dry, and a record kept of the total weight and of the weight of shelled grain from each.

The Breeding Plot.

This should be so selected that the soil will be typical of that on which the main crop will be grown. The same preparation should be given as for the main crop, no extra care or fertilizer being used. The object is to find out which plants will give the best results under normal conditions; if they do well, then they may be expected to do better on well fertilized soils.

Isolation. It is absolutely necessary that the plot should be isolated at least 400 yards from any other sort or from strains of the same sort. Any stray plants from previous plantings must be carefully rogued out before they have a chance to tassel.

Size and sowing. The rows may be 200 or more yards long and of exactly the same length. The seed should be sown on the principle of one row to each cob. After removing the tips and butts from the selected ears, the rest of the grain should be sown in a single row. It is better to drill the seed than to check-row it, as it is difficult to isolate suckers from main stalks when more than one plant occupies a place. Each row should be numbered consecutively and labelled with a stake at the end. With the seed left over from the rows three or four border rows may be planted all round the breeding plot to protect the plot to some extent from depredations.

Detasselling.

It is important that the plants in any one row should not be allowed to pollinate each other, as this weakens and reduces the yield of the progeny. To avoid this the alternate half of each row (*e.g.*, the upper half of rows 1, 3 and 5, etc., and the lower half of rows 2, 4 and 6, etc.) should be detasselled as fast as the tassels appear. The detasselled plants will receive abundance of pollen from the adjacent rows and they only will be used for seed.

As the plants begin to ripen, the earliest maturing or otherwise desirable types among the de-tasselled plants should be marked for use in the next year's breeding plot. At harvest time the total number of fertile stalks and of barren stalks in each row must be counted. All poor and weak rows should be discarded entirely. The ears of all desirable stalks in the good rows are harvested separately and weighed, and the weights compared with those of the original ears. The balance of ears in each row are then harvested and weighed separately. The weights of the good and poor ears in each row together give the yield per row, which is found to vary considerably. From these figures we learn which are the best rows. Taking the ten best rows, the best ears of each are carefully examined, two or more grains of each are carefully measured and compared, and the ten best ears are selected from each row, making 100 ears in all; these 100 ears are reserved for the breeding plot of the following year. After discarding the tips and butts, the rest of the grain from each is placed in a separate bag, labelled and kept in a vermin-proof tin and occasionally fumigated with carbon bi-sulphide until the next sowing season.

The Increase Field.

The grain of the discarded ears of the best rows will still be better than the average seed on the farm, and if not sufficient to sow the main crop, is sown in a field by itself, called the increase field, which will furnish stock seed for the following year.

Cross-Fertilisation.

The maize-plant is specially adapted by nature for cross-pollination, the male flowers being placed in a separate inflorescence, the "tassels" (Plate 43) situate some distance from the female flowers, the "silks" or "beards" (Plate 44); the former are raised on a long stalk in such a way that the falling pollen is wafted by the least movement of the air, away from the silks beneath, thus minimising the chances of self-pollination.

Self-pollination results in deterioration. Cross-pollination from plant to plant of the same variety, *e.g.*, "Hickory King," is essential to the production of the best seed. But cross-pollination between plants of different varieties (*e.g.*, "Hickory King" with "Yellow Cango") is undesirable, and, except in rare cases, to be discussed later, should not be practised nor permitted. Varieties accidentally crossed are now met with all over the country; they produce such unevennesses in size, shape and colour as are absolutely detrimental to the production of a good selling grade, especially for the export trade. Even for mealie-meal for local use on the mines, mixed colours are disliked, as they do not produce that whiteness of meal the demand for which is on the increase.

There is a popular idea that by crossing two sorts of maize the result will be a hybrid combining the characters of the two parents. This may be the case with the first ear obtained from the cross, but it is not always the case in the progeny of the first generation. Experience shows, moreover, that even where it does occur, the second generation produces a great amount of variation from the hybrid, and unless scientifically guided efforts are made this variation will continue from generation to generation for an indefinite period.

Mendel's law of heredity explains the reason for this mixture of characters, and shows how it may be avoided or how to make use of it. Cross-breds of unknown pedigree are difficult to deal with, and it may take years before they yield any desirable progeny. They should, therefore, be avoided and the work of improvement should be started with a fixed type.

Cross-breeding should only be practised or permitted where the effect of crossing is understood; the object sought well-known, and the method well-planned.

Mendel's Law of Heredity.

There are cases in which cross-breeding of varieties is essential to the attainment of certain ends, such as the adding of some desirable character to an already good type, for instance, earlier maturity to "Hickory King"; or for increasing the vigour of a good type which may be somewhat lacking in this particular.

In certain cases and under certain known conditions this can be done, and Mendel's Law shows us how to attain the desired end. Let us take a simple example by way of illustration. Suppose that we have a very good early yellow dent ("flat") maize which yields well and is in every way desirable except for the colour; in other respects it is better than any white variety grown on the farm, but the yellow colour limits the demand; let us designate this variety by the letters AAbb. Suppose also that we have a large white dent variety, which is much later, and, in all respects, inferior to the yellow; let us designate it by the letters aaBB. By crossing these two it is possible to mix their characters and then to separate them again in the progeny of the second generation in combinations differing from those of the parents and which can be accurately anticipated beforehand.

When the tassels of the yellow variety first appear, we remove those of three or four of the best plants, which are then labelled; when the silks of these de-tasselled plants are just ready to appear we tie large brown paper bags over the "ears" in such a way that no stray pollen can reach them. We also collect in a bag the yellow, dust-like pollen from one of the tassels of the white variety. In about two days the bag is taken off each ear in turn, of the "yellow" plants and enough of the "white" pollen is shaken on the "silks" to allow some to fall on to each thread of the "silk"; the bag is then replaced. This work is repeated twice after an interval of about 48 hours between each pollination. The bags are left on for a week or ten days after the final application of the pollen to allow the ears to fill out properly.

When harvest-time comes the ears of grain from the labelled plants will usually be found to be coloured in varying degrees of yellowness more or less like those of the mother-plant, but in many cases paler.

First Generation (F1) Cross-Bred.

These ears furnish the seed of the first (or "F1") generation cross-bred; they are harvested separately, labelled and kept till the next sowing season.

At sowing time a place must be selected for them which will be at least 400 yards removed from any other maize-plants. The

grain taken from each ear should be sown in separate rows, each row should consist of the grain from only one ear. The rows should be numbered with the number of the ear from which the grain has been taken, row 1 from ear 1, row 2 from ear 2, and so on. The rows and numbers may be repeated till the seed is exhausted, but a few long rows of each sort are better than many short ones.

When the tassels begin to appear they must be removed from the alternate half of each row before any of the pollen has been shed, in order to avoid self-pollination; this must be repeated about three times as the tassels do not all appear at once. The simplest plan is to remove the tassels from, say, the upper half of the odd-numbered rows (1, 3, 5, etc.), and from the lower half of the evenly numbered rows (2, 4, 6, etc.) Bagging and hand-pollination will not be necessary in this case, provided the rows are—as already stated they should be—400 yards from any other maize plants. Pollen from the half rows which have not been de-tasselled will fecundate the de-tasselled plants on either side of them.

Second Generation (F2) Cross-Bred.

The ears obtained from these detasseled half-rows will furnish seed of the second (or "F2") generation, and among these grains we ought to obtain the combination we are seeking, viz., a white-grained variety having the vigour and other desirable characteristics of the yellow-grained parent. But not all the plants obtained will be of this character; in fact, Mendel's Law shows us that, where two pairs of characters are concerned, on an average only one out of sixteen individuals will have the desirable characters fixed and transmittable, and that only when dealing with a large number (some thousands) of individuals can we expect to secure even this proportion.

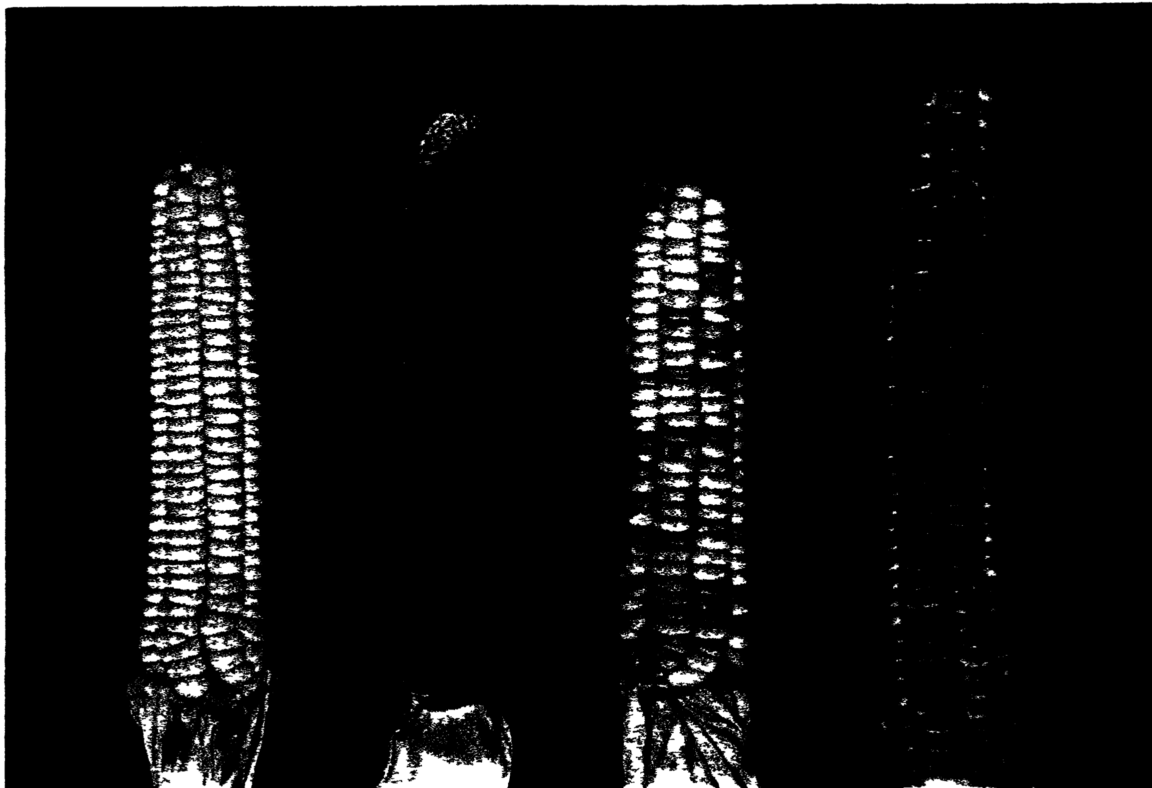
It will be useful here to describe the other fifteen combinations which may be expected.

Dominant *v.* Recessive Characters.

To make the point quite clear, it is necessary to explain that certain characters are found to be *dominant* over others in the hybrid (F1) generation, *e.g.*, colour in the maize grain is generally *Dominant* to whiteness, and that is why, in the first generation of a cross-bred between yellow and white, most of the grain is yellow, not white. Whiteness is, therefore, said to be *Recessive* to yellowness. Lateness of maturity is, in some kinds of plants at any rate, dominant to earliness. There are other characteristics in the two parents which will have some effect on the progeny, but it will be best to deal only with these two pairs for illustration.

Dominant characters.	*Recessive characters.*
AA = Yellowness.	aa = Whiteness.
BB = Lateness.	bb = Earliness.

Each character is represented in the seed by two *gametes* (indicated by doubling the letters) in a combination of two pairs of characters there are, therefore, eight gametes, and sixteen possible combinations into which they may fall. In the case of the two pairs of characters Aa and Bb, the combinations would be as follows:—



Effect of Cross-Fertilisation in Maize.

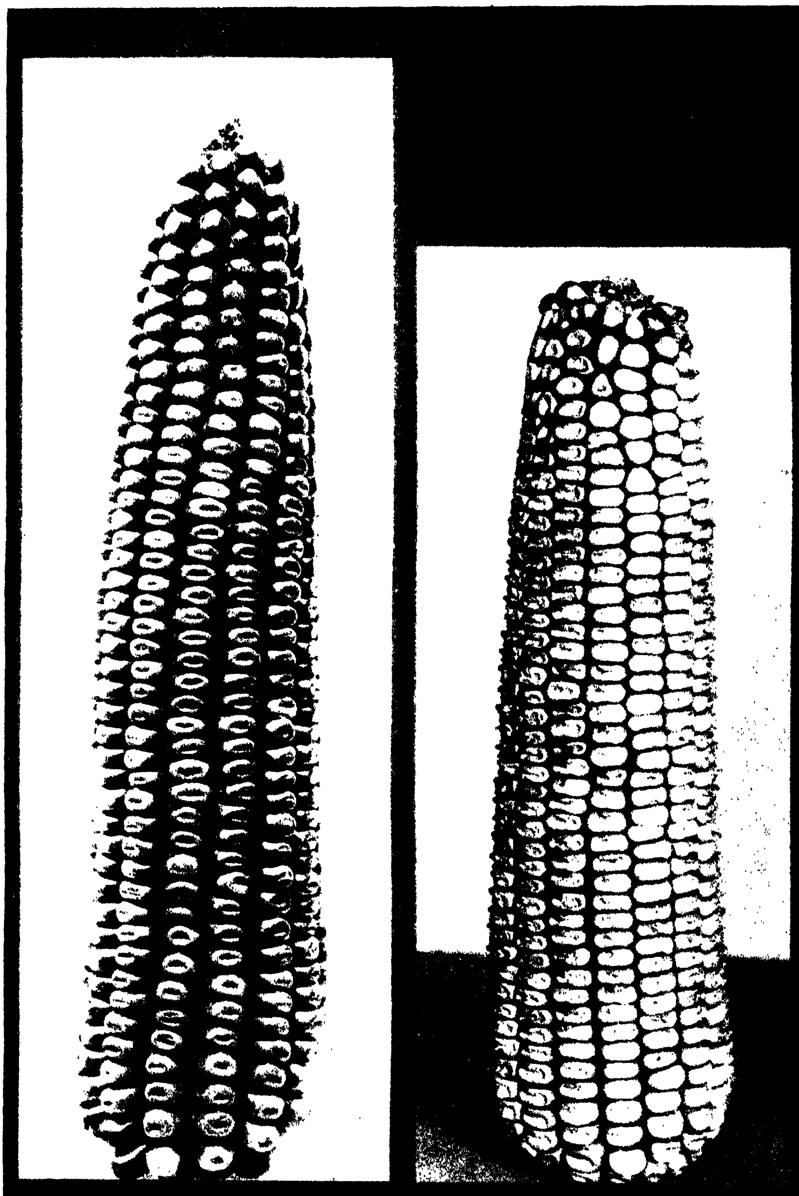


Plate 43. Fig. 1. Fig. 2.

Ears of Maize.

Fig. 1.—Poor form of ear. Spaces too open, thereby reducing the yield per acre.
Fig. 2.—Minnesota No. 13 Maize. A good form of ear, but poor at tip.

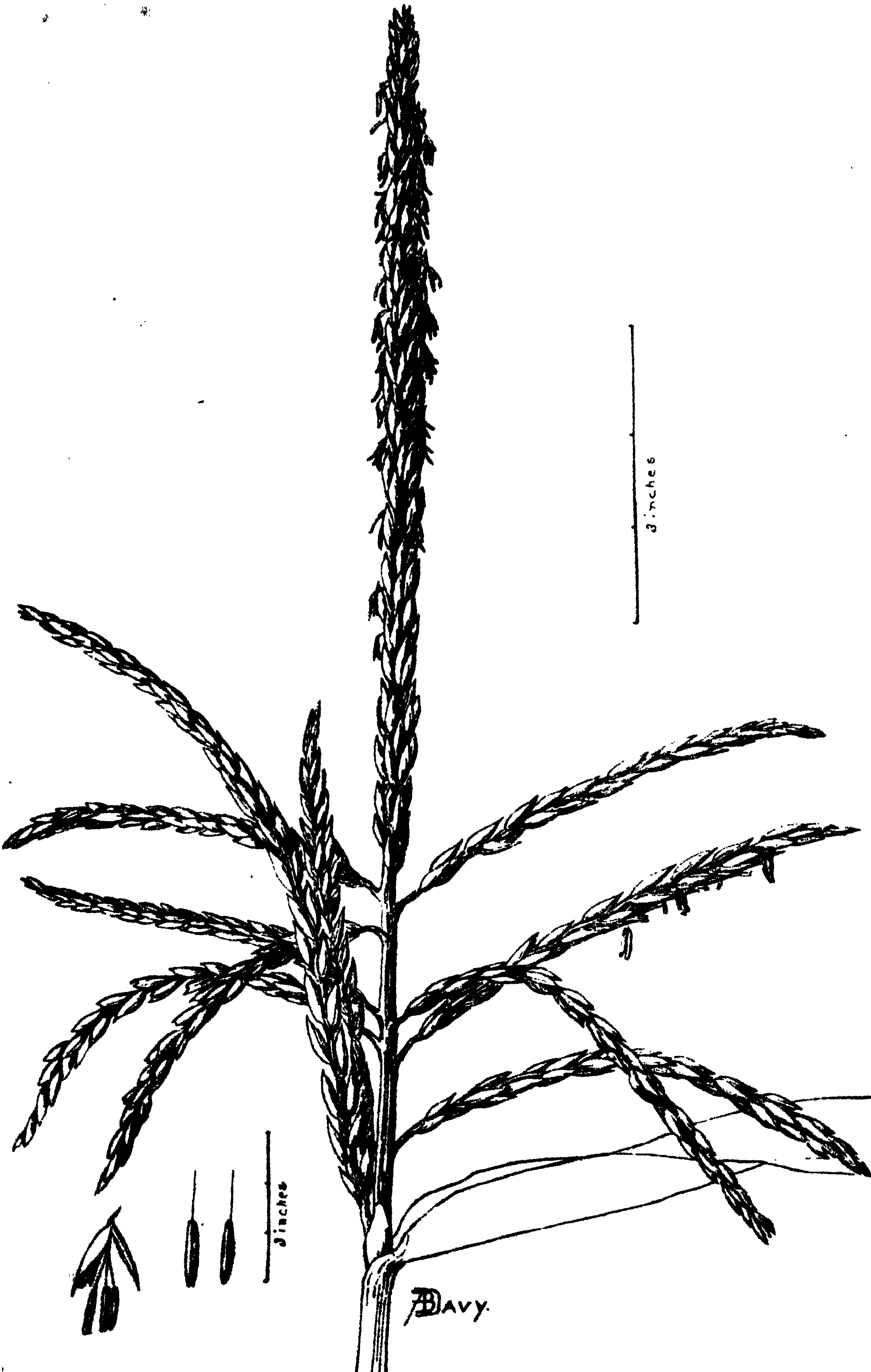


Plate 44. **The Tassel of Maize.**
(Male flowers.)

Plate 45. **The Young Silks of Maize.**

(Female flowers.)

Ready for Pollination.

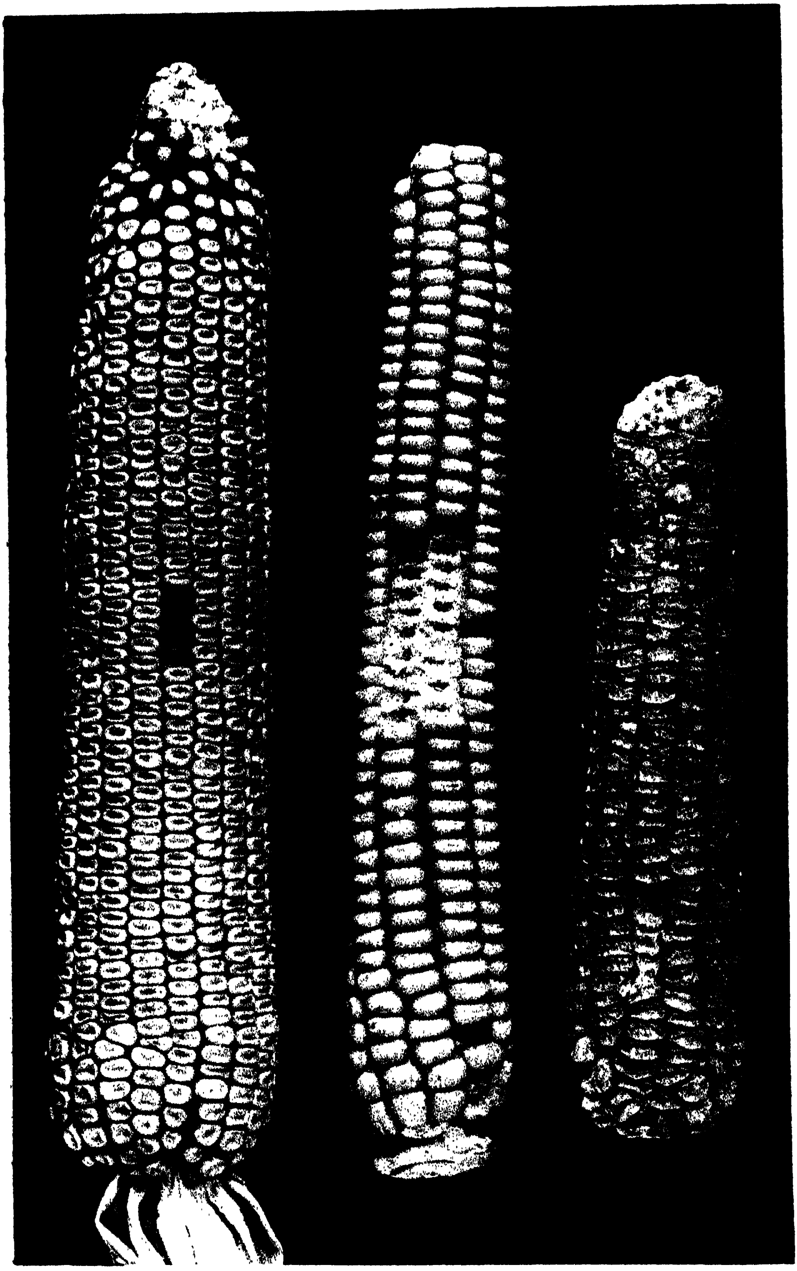


Plate 46. Fig. 1. Fig. 2. Fig. 3.

Three Types of Maize.

Fig. 1.—Dent Maize (*Zea mays indentata*).
Fig. 2.—Flint Maize (*Zea mays indurata*).
Fig. 3.—Sugar Maize (*Zea mays saccharata*).

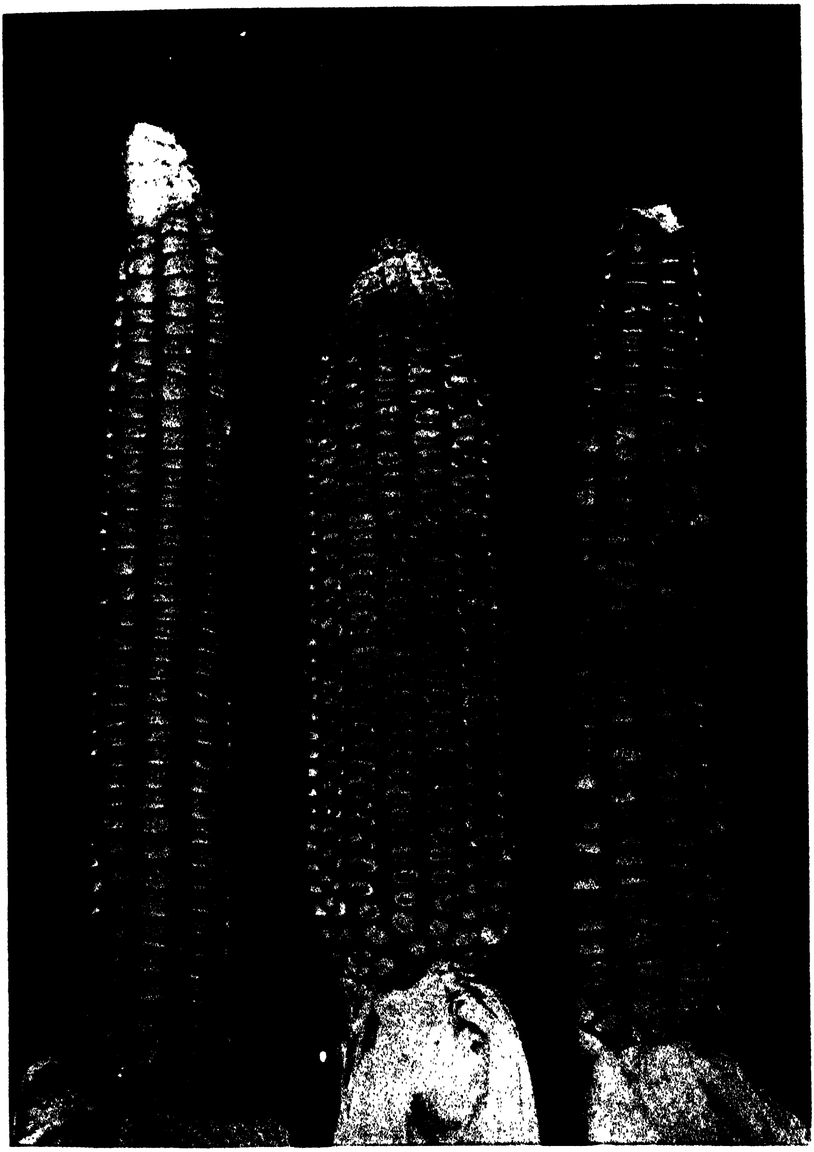


Plate 47. Fig. 1. Fig. 2. Fig. 3.

Two New Varieties and a Hybrid.

Fig. 1.—North Dakota Maize (matured in 98 days).
Fig. 2.—Minnesota No. 13. A heavy yielder.
Fig. 3.—Effect of mixing Sugar and Flint varieties.

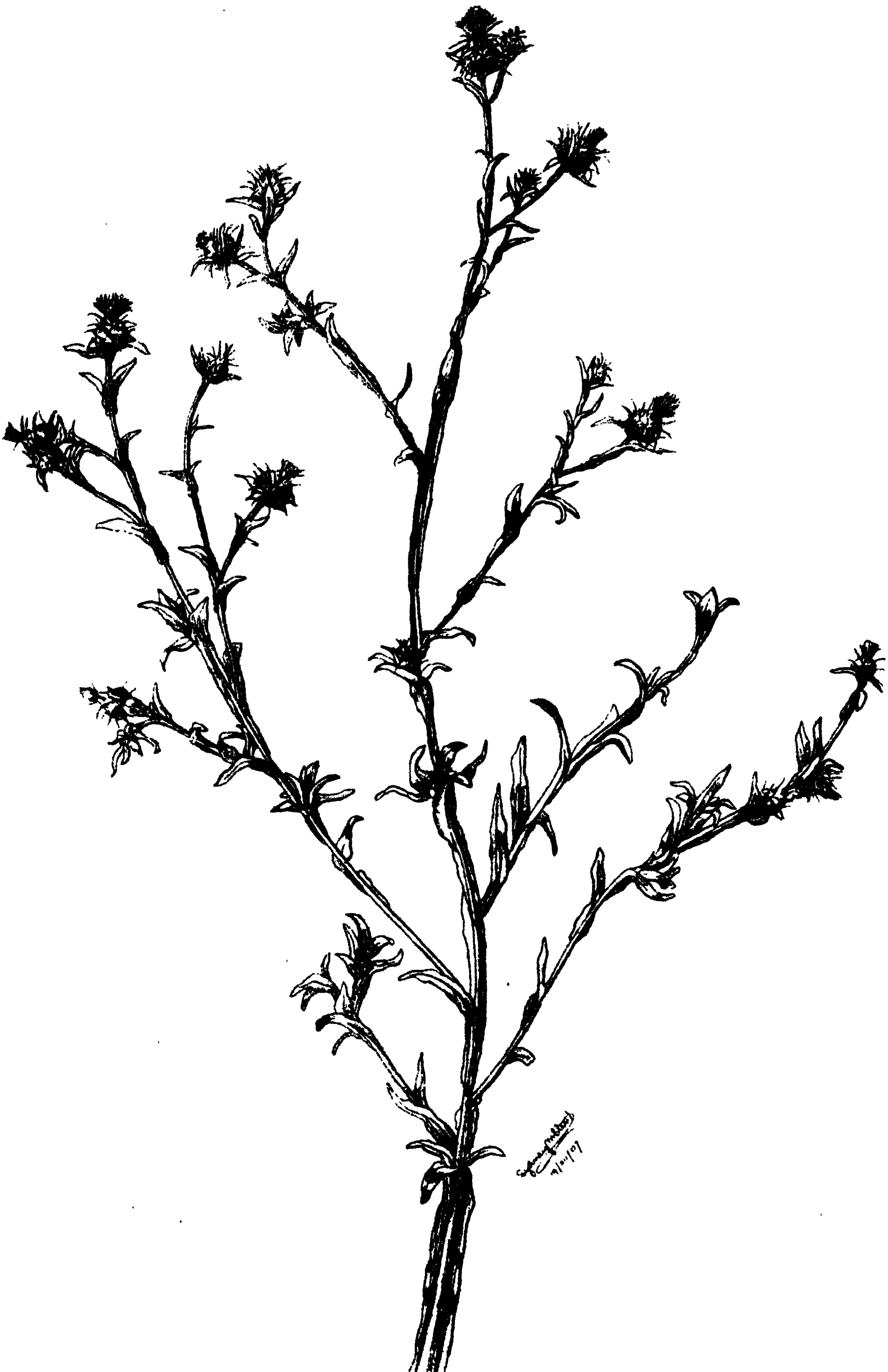


Plate 48. **The Malta Thistle.**

(*Centaurea melitensis.*)

Recently introduced from the Mediterranean, and spreading near Pretoria.

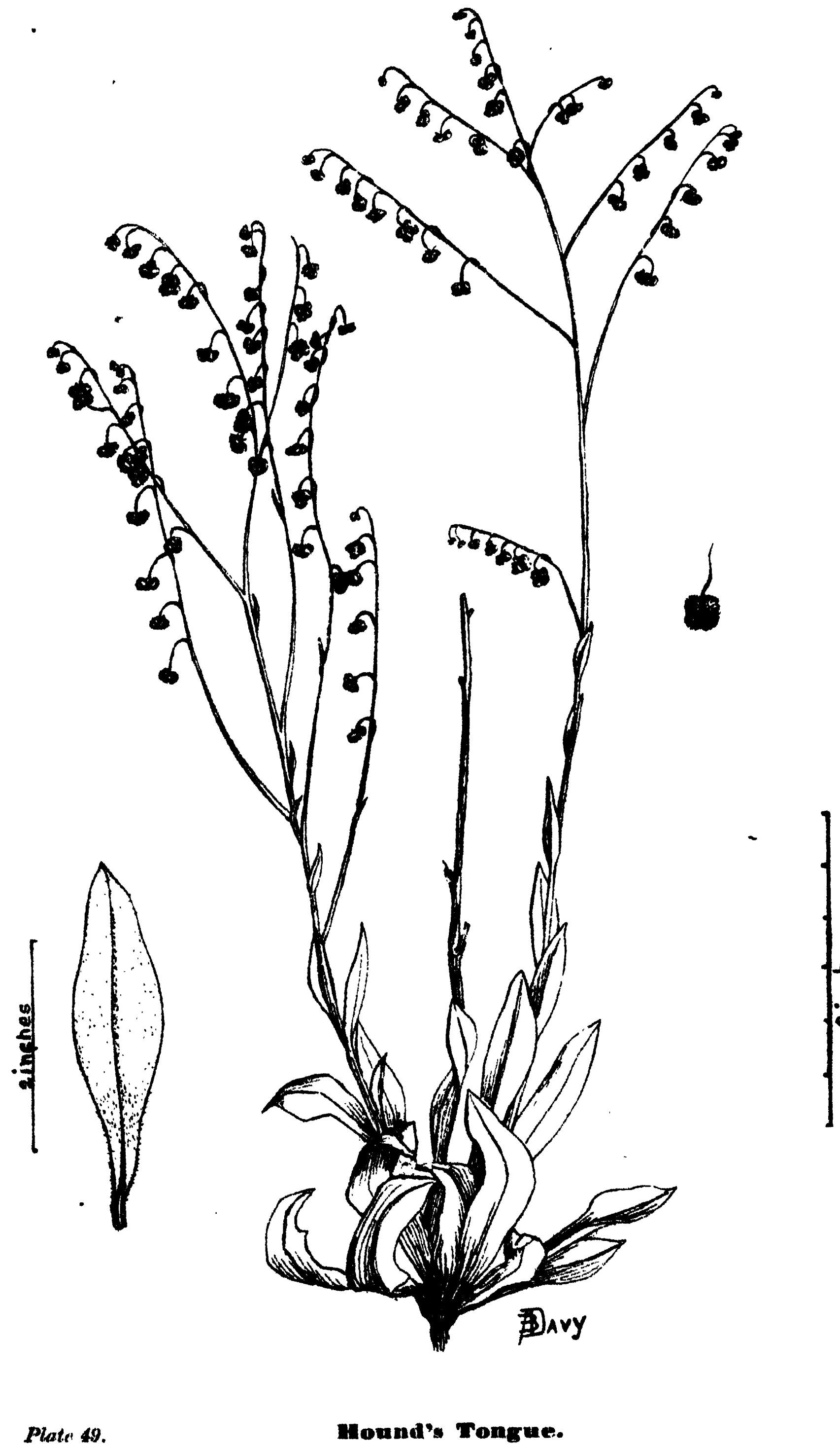


Plate 49. **Hound's Tongue.**

(*Cynoglossum micranthum.*)

A new weed from India widely spread on the Eastern High Veld. Injurious to wool.

Plate 50.

A Field of Velvet Beans.

Grown for green-manuring at the Government Botanical Station, Pretoria.

4 in which AA (yellowness) occur together;
4 ,, aa (whiteness) ,, ,,
4 ,, BB (lateness) ,, ,,
4 ,, bb (earliness) ,, ,,

The AA or "Yellow" Character.

The four possible combinations of the "AA" or "yellow" character are:

AA (yellowness) with BB (lateness);
AA ,, ,, Bb (lateness and earliness);
AA ,, ,, bB (earliness and lateness);
AA ,, ,, bb (earliness).

The union of the characters b and B, or of B and b, produces the same result, so we may express the above combinations by the formula AABB + 2AABb + AAbb.

The "aa" or "White" Character.

The same way the "aa" or white character unites in the following combinations:

aa (whiteness) with BB (lateness);
aa ,, ,, Bb (lateness and earliness);
aa ,, ,, bB (earliness and lateness);
aa ,, ,, bb (earliness).

This may be expressed by the formula aaBB + 2aaBb + aabb.

The Remaining Eight Combinations.

So far we have dealt only with those cases in which the AA or yellow character remains pure or unsplit, and the aa or white character remains equally pure. But Mendel's Law shows that the combinations of "A" yellowness with "a" whiteness, and four other combinations, "a" whiteness with "A" yellowness, may occur.

The resulting possible combinations would thus be

Aa (yellowness and whiteness) with BB (lateness);
Aa ,, ,, ,, ,, Bb (lateness and earliness);
Aa ,, ,, ,, ,, bB (earliness and lateness);
Aa ,, ,, ,, ,, bb (earliness);
aA (whiteness and yellowness) ,, BB (lateness);
aA ,, ,, ,, ,, Bb (lateness and earliness);
aA ,, ,, ,, ,, bB (earliness and lateness);
aA ,, ,, ,, ,, bb (earliness).

If A is dominant to a, Aa is the same as aA, just as we saw that Bb is the same as bB. We may, therefore, express the result by the formula 2AaBB + 4AaBb + 2Aabb.

The Nine Sets of Combinations.

Adding together the three sets of formulas, we obtain the following nine sets of like combinations:—

AABB + 2AABb + AAbb;
aaBB + 2aaBb + aabb;
2AaBB + 4AaBb + 2Aabb.

Mendel's Law further shows that, as a rule (subject, perhaps, to certain rare exceptions), the opposing (dominant and recessive) characters of a pair, as Aa (yellowness and whiteness), or Bb (lateness and earliness), do not remain permanently combined, but split apart in the succeeding or later generations. All the cases in which both dominant and recessive characters of either pair occur can, therefore, be considered as hybrid and unstable combinations ("heterozygotes") which will split up later. In other words, when we cross a yellow and a white or an early and a late variety together, we do not, usually, obtain a new and stable variety which is *intermediate* between them.

Examining the above nine sets of combinations, we see that five of them, including twelve separate combinations, are heterozygote (as shown by the large and small letters together), and, therefore, unstable. Only four are composed of two pairs of like gametes and are, therefore, stable or fixed. Two of these are like the two parents, viz., AAbb, the yellow early, and aaBB, the white late. The other two are entirely new combinations, viz., "AABB," a yellow late, and "aabb," a white early, the latter being *the type we sought to obtain from the start*. We must remember, however, that, on the average only one out of sixteen (6¼ per cent.) of the progeny will be of the desired type, and then only if we have a sufficiently large progeny in the second generation.

To Propagate the New Type.

In order to propagate the new type, it will be necessary to grow it apart from all the rest, and to avoid any chance of stray pollen falling upon it. If there is only one plant the silk should be bagged when it first appears and hand-pollinated three times with pollen from its own tassel. If two or more plants of the new type have been obtained, they may be cross-pollinated between themselves to minimise the effect of in-breeding. All the progeny of the third (F3) generation will then be "white earlies" if no accident has occurred. For future propagation these should be grown in a block at least 400 yards away from any other sort, and allowed to interbreed, the most robust plants only being selected for seed purposes.

If we continue to propagate from the two which resemble the parents as regards the two pairs of characters, yellow early and white late, we shall probably find that they show more vigour than do their parents, and unite other characters of the parents in varying combinations. It is sometimes found desirable to propagate these in place of the original parents, or to effect a cross back to the parent.

Importance of Careful Choice of Parents.

If the parents chosen for this purpose had been a "yellow late" and a "white early," and the object had been a "yellow early," the result would probably have been far less satisfactory. On the hypothesis that lateness is dominant to earliness, the result would have been as follows, viz.:—

$$\left.\begin{array}{l} 4\ \text{AaBb} \\ 2\ \text{AaBB} \\ 2\ \text{Aabb} \\ 2\ \text{AABb} \\ 2\ \text{aaBb} \end{array}\right\}\ \text{heterozygotes.}$$

1 AABB. Yellow late (like one parent).
1 aabb. White early (like the other parent).
1 aaBB. White late; a new but undesirable type.
1 AAbb. Yellow early, the new type desired.

The difficulty would have arisen in isolating the desired type, for yellow being dominant to white in maize, it might be exceedingly difficult to distinguish AAbb from AABb, or, indeed, from any other heterozygote in which A (yellowness) occurs.

It could be done, with scientific care, in the course of two or three more generations, by growing separately all the yellow grains produced in the F2 generation, bagging and hand-pollinating each with pollen from its own tassel, and discarding all the white grains produced. The yellow grains of the F3 generation would have to be sown again separately, all the late plants cut out, and those remaining be again bagged and hand-pollinated with their own pollen. Careful record would have to be kept of those plants which showed no splitting up into whites and yellows, lates and earlies, and if this were found to hold till the F4 generation, it might be assumed that the AAbb type had been secured.

It will at once be apparent that this is far more laborious and uncertain than the relatively simple isolation of the pure recessives. *It is, therefore, of the greatest practical importance to the plant-breeder to know with scientific accuracy what characters are Dominant and what Recessive,* and we are, at the present time, engaged on a series of experiments to determine these points.

THE ENTOMOLOGICAL SECTION.

INSECT ENEMIES OF MEALIES IN THE TRANSVAAL.

By C. W. Howard, B.A., F.E.S., Government Entomologist.

In view of the extensive preparations which are being made for the exportation of mealies from the Transvaal, a study of the insect pests of this cereal becomes a matter of prime importance. The past season was unusually unfortunate for mealie growers as far as pests were concerned. These, in conjunction with the long continued drought during the latter part of the summer, have completely ruined the crops in many districts.

The first pest to be noticed was the cutworm, which began to appear just as the young mealies came above the surface of the soil. They were eaten off several times in succession, necessitating a second and often a third replanting. Then, in November, the mealie stalk borers began to appear in such numbers as to injure from 25 per cent. to 50 per cent. of the plants. There may be a tendency on the part of some to overestimate the injury done by this latter pest, which was considerably accentuated by the drought coming soon after it had made its appearance.

We have received many letters asking for methods of combating this pest, and some dissatisfaction has been expressed because our recommendations have not been of such a nature as to be easily carried out. To successfully keep these insects in check means that the farmer must revolutionise his farm practice. It will mean much additional labour, but the methods to be mentioned have been successfully followed in other parts of South Africa and by some of our most progressive farmers in the Transvaal. There is no reason why they cannot be followed in the Transvaal.

There are three important pests of mealies, which I will mention in order:—

1. Cutworms or Mest Wormen.

Cutworms are usually noticed early in spring or summer when they destroy the young plants by cutting them off just at the surface of the soil. During the day the worms remain hidden in the soil at the base of the plants, only emerging at night to carry on their destructive work. Not only mealies are attacked, but also many garden and field crops, such as tobacco, tomatoes, cabbage, potatoes and many wild plants and grasses.

The Transvaal supports many different species of these cut-worms, the life history of none of which have been carefully worked out. The life history, however, of the most important injurious ones seems to be more or less as follows: The dark-coloured, fat, greasy-looking worms, which we find early in spring, have spent the winter hidden away in the soil as half-grown caterpillars. With the first growth of vegetation they emerge from their winter quarters, begin to eat, and soon reach full growth. They then enter the resting or pupa stage in the soil, and, by mid-summer, the adult moths emerge.

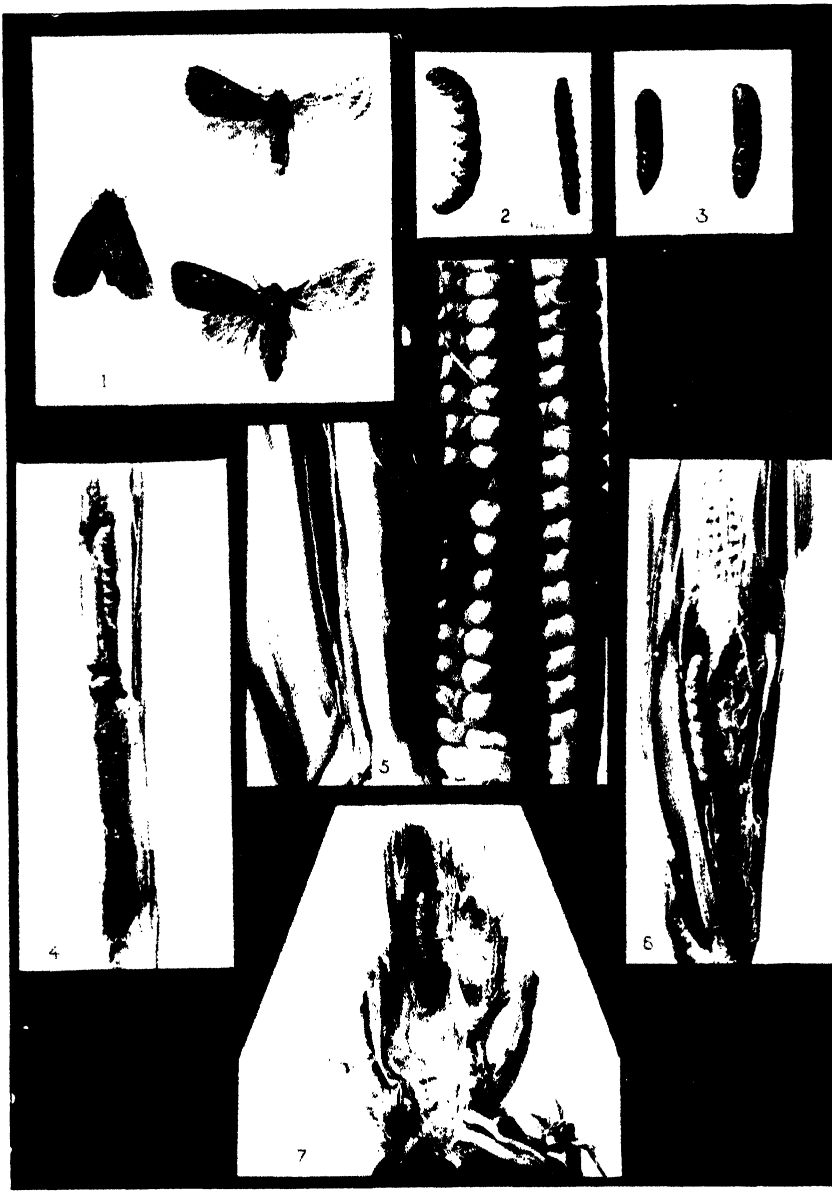


Plate 51. **Mealie Stalk Borer.**

Fig. 1. Winged Moths. Fig. 2.—Caterpillars. Fig. 3. Pupas.

Fig. 4.—Stalk of Kaffir Corn showing worm in its burrow.

Fig. 5. —Mealie Cob Worm feeding in cob.

Fig. 6. Méalie-ear showing Stalk-borer caterpillar burrowing at the base and eating the **kernels.**

Fig. 7. Stalk of Kaffir corn showing pupa wintering near the base.

These are dark-coloured, either greyish or brownish moths of from 1 inch to 1½ inches in expanse, which only fly at night time, and are, therefore, seldom seen, except when attracted to lights. These moths soon lay their eggs upon their various food plants. The little worms hatch, and, being half-grown before winter, pass that period in a dormant condition in the soil. Some species may spend the winter as pupæ in the soil, emerging early in summer and laying their eggs in grass and other plants. The resulting worms would then be ready to attack the young mealies when they sprout.

* * * *

The weak point in the life-history of these creatures is this dormant stage in the soil during the winter, whether as worms or pupæ, and it is at this time that remedies will be effective. For this reason we recommend fall or early winter ploughing. The ploughing should be deep, and the field left fallow all the winter. In this way all young cutworms will be buried and crushed, or else will starve for want of food, and there will be no grass or other plants left upon which moths can deposit eggs. By early winter the partly-grown cutworms have entered the soil to hibernate, or else have pupated in the soil. Deep ploughing at this time exposes them to the action of the weather or else crushes them. Spring ploughing is too late as the worms have usually emerged and begun work before ploughing begins.

A second point for consideration is the necessity of clean culture. As I stated above, these cutworms feed upon a great variety of plants, and if a field is allowed to be overgrown with grass and weeds of all sorts it becomes a perfect paradise in which they may develop in large numbers, whereas land kept clean and free of weeds furnishes less food for them, and they will be forced to migrate to other parts. Cultivation and the weeding of mealies is considered an essential practice in America, the country which takes first place in maize production, and the best farmers in South Africa are now following her example. A field covered with rubbish, such as old mealie stalks and weeds, furnishes a better hiding place for insects during winter, which condition will be obviated by fall or autumn ploughing.

These recommendations about fall ploughing and cultivation are not idle dreams on our part, but are recognised as good farming methods throughout the world. In South Africa, where we suffer so much from lack of rains, there is the greater need of following them. Fall ploughing leaves the soil soft and porous and aids in the retention of moisture.

Just here, mention should be made of the usefulness of birds and fowls as insect destroyers. Birds have come prominently to our notice, recently, as locust destroyers. They are, probably, our most valuable natural ally in that connection, but we must not overlook their value as destroyers of other insects. The presence of all insect-eating birds should be encouraged about cultivated fields, as the number of insects destroyed by birds reaches an enormous number. A flock of fowls, if allowed to roam over a mealie field, and to follow after a plough, would scratch out and devour immense quantities of cutworms and other harmful pests.

Another recommendation, of practical use, however, only in small gardens where plants are growing, before cutworms are noticed, is the poison bait. This is made by mixing one part of Paris green, or arsenic, to 25 lbs. of wheat-bran, or mealie meal, until it forms a thick paste. This should be placed on the ground—a spoonful near each plant. The cutworms prefer this to any other food.

After land has been prepared for sowing, and before the mealies are above the surface, the cutworms may be cleared off by spreading, at intervals, handfuls of grass, lucerne, or other green vegetation which has been dipped in a strong solution of Paris green. As no other food is present, the hungry cutworms will eat this to their destruction before the crop is up. The poisoned grass may be scattered very thinly, and may be put in place just before nightfall, so that it will be fresh for the worms. All animals must be kept away from the lands thus treated.

2. Mealie Stalk Borer or Mealie Grub (*Sesamia fusca*).

Considerable confusion seems to exist in the minds of many between this worm and the cutworm. For this reason the name *mealie stalk borer* is preferable, because it describes accurately the chief characteristic of the insect. (Plate 51.)

Its presence is usually first noticed by the tops of the young plants withering and turning to a brown scorched colour, due to the heart being eaten out of the plant. These plants do not usually succumb, but, later, put out suckers, and attempt to regain their position in the field, but they seldom produce cobs. When plants are attacked, later in the season, they do not usually show any distinct signs, as they are then old enough and vigorous enough to resist the injury done.

The adult insect is a dark brown moth with light smoky-coloured hind wings, and a wing expanse of about 1½ inches and about 1 inch long. These moths also fly only at night. They make their first appearance about the end of October, and continue through November and even to December, but are most plentiful about the middle of November. The eggs are placed by the female moth, in clusters, under the edges of the leaf sheaths, where they are protected from the rain and other enemies. The young worms which hatch out begin at once to eat into the plant, working towards the centre where they, later, form the long burrow. If the young plant entirely succumbs, the worm may emerge and go to another plant where it usually enters near the base. These worms reach maturity, pupate in the burrow, and the moths begin to emerge about the middle of January. Early in February they begin to lay their eggs on the inside of the leaf sheaths, selecting as before the young plants in preference to old stalks. The caterpillars of this second brood do not mature before the end of summer, but spend the winter in the old stalks. When spring arrives they transform to pupæ, and the moths emerge from the old stalks from the end of October onward.

* * * *

The winter stage of this insect is again the weak point where we must concentrate our forces for success in combating it. All

measures must be applied to Kaffir corn, teosinte, broom corn and all other sorghums, as well as maize, for all of these plants serve as its hosts.

The most important step is the destruction of all stalks of mealies and other plants mentioned during the winter. The present careless method employed by the farmer is to allow the stalks to remain on the land all through the winter under the plea that they will serve as food for his cattle. The mealie worms remain in the stalks unharmed by the cattle, for they are always at the base of the stalks and never near the top, and the moths emerge next spring ready to disseminate their species over the mealie lands. This practice is wrong for another reason, namely, that the stalks left standing are not at their best for feeding cattle. The same stalks, if cut and dried before completely dead, would have much more nourishment in them, and would make better forage. This method of cutting the stalks at harvest time, stacking them up to dry, and then feeding them to cattle is extensively carried out in America. Any worms left in such stalks would be destroyed during the winter, but care must be taken to see that all roots and stubble left in the field are ploughed in and covered deeply, or pulled out and burned, because the worms prefer to spend the winter as low down in the stalk as possible.

The other alternative is to gather all the stalks before the middle of winter and burn them. The ploughing-in of stalks is frequently recommended, but very few people in South Africa plough deeply enough to make this method practicable. Unless all stalks can be completely and deeply covered moths will undoubtedly emerge.

Rotation of crops is often of value. It is well known that when mealies are planted at some distance from lands where they were grown during the previous season, they are more likely to be free from infestation. Therefore, during the coming season, new mealie lands should be made at some distance from the old ones, planting the lands to some other crops not related to mealies, such as potatoes or manna.

* * * *

Mealies should be planted as late as possible so as to avoid the first brood of moths and yet have time to come to maturity. This date is well known in the different sections of the Colony. By this time most of the moths will have perished or laid their eggs on other plants, and the crop will escape extensive infestation. This fact has been long recognised by our farmers, but a slight improvement might be advantageously adopted, *i.e.*, the planting of a few rows of mealies very early, say, early in October. These will act as a trap for the early moths to oviposit upon. By December 1st they should be pulled up and burned so as to destroy all worms which they may be harbouring.

One of my colleagues in another part of South Africa has recently suggested that we might wipe out this pest by all of our farmers co-operating and agreeing not to plant any mealies for one season. The reason advanced for this is that during the late war very few mealies were planted and the pest nearly died out; since then it has taken up to the present year to become excessively destructive in the Orange River Colony and in the Transvaal. It is certainly true that the insect has been increasing in numbers yearly for the last five or

six years, and the reason given may be the true one; but, personally, I hardly care to recommend such a drastic step as that of not planting mealies for one or two seasons. I have no doubt that it would be effective, if carried out thoroughly, but it would be necessary to have the co-operation of the whole of South Africa which would be impossible. Furthermore, it would mean not only a suspension in the planting of mealies, but Kaffir corn, teosinte, sorghum and all related plants. If the methods which I have recommended could be carried out simultaneously by all farmers the result would be quite satisfactory.

* * * *

3. Cob Worm or Beard Grub (*Heliothis armiger*).

This third pest of mealies might easily be confused with the mealie stalk borer when only its habits are considered. It seems to confine itself mostly to the cobs, eating away the soft milky kernels before they become hard, and is always concealed by the husks about the cob. The larva of the stalk borer is also often found in the cob, but the two are easily distinguished. The stalk borer is usually of a pinkish or creamy colour with a very small black spot on the side of each segment, while the cob worm is greenish or brownish with stripes of darker colour extending the full length of the body.

This cobworm feeds upon many other plants such as tomatoes and cotton, and as a pest of mealies it cannot be considered in the same rank as the two other mentioned insects. (Plate 51, fig. 5.)

There are several generations each year, the last spending the winter as pupæ in earthern cells in the soil from which the moths emerge early in spring, so that fall or early winter ploughing, as recommended for cutworms, is the most practical remedy.

Summary.

Stated briefly, the methods which the farmer must follow to keep in check these formidable enemies of mealies are as follows:—

1. Fall (autumn) or early winter ploughing for cutworms and cobworms.

2. Clean culture, obtained by frequent cultivation of mealie lands, for cutworms.

3. Burning, for mealie stalk borer, of all mealie stalks, including the roots, before the middle of winter, or cutting of stalks at harvest time and drying them for cattle food. These stalks must be fed up before spring, and all roots and stubble removed from the land and burned before mid-winter.

4. A trap crop of mealies should be planted early in October, but the main crop as late as possible to avoid infestation by the early moths of the stalk borer and yet have time to come to maturity during the growing season.

THE HORTICULTURAL SECTION.

THE PEACH IN THE TRANSVAAL.

By R. A. Davis, Government Horticulturist.

The coloured plate which is shown at the commencement of this issue is one of the very best of the cling stone varieties. The originals were grown in the garden of the Hon. E. P. Solomon, at Parktown, Johannesburg, where the writer had the pleasure of seeing the finest selection of yellow peaches he has met with in South Africa. In fact, it is extremely improbable that any have been produced either in Cape Colony, the Orange River Colony, or the Transvaal which were as a whole as fine in colour, size, quality, and flavour. One of the remarkable features of this collection is that it consists of varieties which are usually classed as failures in this Colony. The kinds which were doing so well were Foster, Elberta, Early and Late Crawford, Newhall, Mary's Choice, Salway, and that illustrated, "Sellar's Golden Cling." This group contains the majority of the best yellow peaches known to horticulturists. One naturally enquires how it is that these varieties, usually not desirable here, have proved such a success in this particular instance. The reply is that in this case a combination of favourable circumstances were present, embracing first an almost perfect peach soil, secondly a fair amount of shelter, and thirdly the right climate, and this can only be attained in the Transvaal at a certain altitude. Complaints have been frequently made to the writer that some kinds of peaches have not borne fruit in certain districts, and as a rule the trees imported from Cape Colony have been the most severely condemned. In many cases the owners of these trees were themselves to blame, having purchased trees possibly in an indiscriminate manner from the description given of the fruit in a nursery catalogue without having taken the trouble to find out whether the kinds selected were suitable to High Veld or Low Veld, or, what means the same thing, to a temperate or sub-tropical climate.

Now it cannot be too clearly pointed out that most of the "imported" varieties of peaches hailing from Cape Colony are *not* suited to our warmer districts. They have their origin largely in Europe and the temperate portions of North America, and are quite unsuitable on that account for planting at any altitude, let us say, as low or lower than that of Pretoria. On certain portions of the High Veld they succeed fairly well, much depending on the soil and situation in which they are planted. Portions of the Witwatersrand, Heidelberg, Krugersdorp Districts, and the country generally south of a line drawn from Lichtenburg on the west through Johannesburg to Belfast on the east, are more suitable to the usual imported varieties of peaches than are the warmer districts of the Colony. Even in the section named there are many spots where a tropical variety of peach will thrive exceedingly, whilst the kinds suitable for a temperate climate with a fairly moist atmosphere are a failure. It has been pointed out previously in these pages that within the past few years the adoption of the Chinese strain of peaches has proved a great success in the Middle and Low Veld, and that there is now no question but that peach trees with well established habits of regular bearing may be obtained within the

borders of our own Colony. It is a pleasant duty to chronicle the fact that within the past two years no less than seven kinds have been originated in the Transvaal which appear to be able to adapt themselves to the conditions which exist in both extremes of our climate. Particulars of these will duly appear later on, when the Government nurseries and local producers have a supply of these trees for sale. One of the most successful of these is a chance seedling raised by Mr. Austin Brook, of Silverton, near Pretoria. It bids fair to rival the early Crawford in size, quality, and flavour, and has the merit of bearing heavily and regularly in a climate which may be classed as distinctly sub-tropical, and where the Early Crawford type is practically useless. It has hitherto been a matter of extreme difficulty to obtain a yellow free stone peace of first class quality with regular fruiting habits in the Transvaal. With the advent of the "Brook," as this new fruit has been named, a good peach which will bear comparison with some of the best imported kinds has been secured, and the public at large are indebted to its originator, who has generously placed the whole of the available cuttings from this tree at the disposal of the Department for the present season.

Whilst on the subject of the suitability of different kinds to different climates, it must not be forgotten that there *are* a few—and only a few—of what may be called Temperate Zone peaches which will fruit with some degree of regularity and thrive generally in our warmer districts. Amongst these Dr. Hogg stands out pre-eminently. This is somewhat singular, as this peach is purely an English variety, and has only been grown in South Africa for a comparatively short time. Some one or two others, which are undoubtedly seedlings, probably originating in Cape Colony, may be named, such as Early and Late Constantia.

It is fortunate that there are some good Transvaal peaches which can also apparently adapt themselves to a very wide range of climate; chief amongst these comes the St. Helena or Transvaal Yellow, an excellent cooking and canning fruit, but of little use for eating out of hand. The White Cling and Mooi Nooi are also in this category, and it is surprising to what a fine size these attain if the necessary attention is given to pruning the trees and thinning the fruit properly.

It is only right to warn our readers that the Sellar's Cling Peach shown here is not recommended for general planting by this Department. It is given merely as an illustration of one of the most notoriously shy bearers, planted in an ideal situation, and carefully tended, having so appreciated its surroundings as to make a decided change for the better in its fruiting habit. A summary of the above amounts to this:—

That for the Middle and Low Veld Districts the Chinese strain of peaches, together with some originated in the Transvaal and a few imported kinds, are the best and most reliable bearers.

For the High Veld many of those imported from Cape Colony are successful, together with those generally known as Transvaal varieties.

Full information as to varieties suitable for certain districts may be obtained on application to the Department.

THE TOBACCO SECTION.

NOTES ON TOBACCO.

By J. van Leenhoff, Chief of the Tobacco Division.

It will be of interest to readers of the "Journal" to know that some valuable results have been obtained from our work at Rustenburg, Barberton, and Pretoria, as well as from various experiments on private farms, all of which will doubtless prove of value to the tobacco industry. I propose to issue articles at the proper season from data obtained. For instance, at the present time the farmer should be considering what soil to select for planting his next season's crop of tobacco, and how and where to prepare his seed beds, and so this article will deal with these matters. Later, as the season advances, the treatment of seed beds, transplanting, topping, harvesting, curing, seed production, etc., will be discussed.

Tobacco Soils.

Before engaging in the business of tobacco growing, the prospective planter should ascertain whether he has suitable land for the purpose, and, if so, for what class of tobacco it is best adapted. Texture and the structure of the soil have a marked influence on the character of the tobacco produced.

Tobacco can be grown on a great variety of soils. Soils containing large quantities of sand offer better drainage than clayish soils. Sandy soils are, however, poor in plant food, and the plants thereon often suffer badly during a drought, as such soils retain very little water. Sandy loams are more satisfactory, for whilst containing sufficient sand to provide the necessary drainage, they possess clay, holding moisture well, also vegetable matter, besides usually richer in plant food.

The ideal soil is a sandy loam with a clay sub-soil about one foot in depth. These soils contain a larger amount of plant food, and the sub-soil prevents this from washing down into the lower layers of the soil, where it would be out of reach of the roots. Fertilisers should be used in tobacco growing, and therefore the soils which are most retentive are usually the best.

Tobacco fields, especially those on heavy soils (such as the so-called turf soil and red clay soils in the Transvaal) should always be thoroughly drained. During the season 1906-7 a large percentage of the tobacco crop planted on this turf soil was lost owing to standing water. The plants were soaked in water and beyond the reach of the oxygen from the air, since water excludes the air from the soil and so tends to smother the roots. The remedy, of course, is to drain those portions of the field which are too wet. However, in a dry season like 1907-8 the heavier soils have generally given better results on account of their greater water-retaining capacity.

The tobacco plant will not endure a very wet soil, such as, for instance, turf soils in the wet season; at the same time the crop requires a fairly large amount of moisture in a dry season. On poor, open and

sandy soils it is often difficult to maintain a sufficient supply of moisture, especially just after transplating. Thorough cultivation is, of course, a good remedy.

Humus, *i.e.*, decayed vegetable matter, is another important factor in retaining moisture. This may be increased by ploughing under stable manure, leguminous crops, leaf mould, etc.

In an open porous soil humus tends to fill up the spaces between the soil grains, and helps to make such soils more compact. The humus acts as a great sponge, and absorbs large quantities of water, so that during a drought it aids in retaining moisture. In many soils humus is just as essential as cultivation.

It has been proved on our Experiment Station at Barberton that an excellent tobacco crop can be grown on a sandy loam by the thorough preparation of the land. During the growing season we had practically no rain, and did not possess any facilities for irrigation, and only a small dressing of lime was applied. Plate No. 52 shows a crop of cigar filler and binder tobacco. Plate No. 53 a crop of heavy shipping tobacco, which it is hoped may become a good article in the British Navy.

Most of the Transvaal soils adapted for tobacco culture contain a rather small amount of plant food, very little humus, and are also poor in lime, with, perhaps, the exception of the turf soils. Plant food and humus must therefore be supplied in some form.

Stable manure is usually richer in nitrogen than in potash or phosphoric acid, and hence is not a well-balanced fertiliser for tobacco. At the same time, where quantity rather than quality is desired, it answers the purpose quite well.

Stable manure is not only valuable in providing plant food, but it also retains the moisture in the soil, besides setting free potash, which is largely used by the tobacco plant.

The best time to apply stable manure is at the end of the summer, say March or April, or even earlier, so that, with the help of the late rains, it may thoroughly decompose in readiness for the following season's crop.

The question of tobacco fertilisers is an important one. Transvaal soils are usually poor, and this being the case plant food must be supplied. Artificial manures are costly, and must therefore be applied economically. These manures can be applied just before transplanting, say, about September or October. This subject will be dealt with at greater length in a later article.

In preparing the soil for tobacco crops, it is well to begin one or two years before the land is required. By a rotation of crops, and by sowing legumes, if not sufficient stable manure is at hand, such as velvet beans, lupins, cow-peas, etc., the land can be greatly improved, and if these crops are turned into the soil and allowed to decompose, a large amount of humus will also be added. Many Transvaal soils, when treated in this manner, and with the aid of chemical fertilisers, will yield good tobacco crops.

I would like to quote an extract from my previous article in connection with the use of the old tobacco stalks and roots as manure. It should not be forgotten that the stalks and roots of the tobacco plant naturally contain a large proportion of the necessary plant food.

Boussingault, the well-known French chemist, found half a century ago that the quantity of carbon, nitrogen, phosphoric acid and potash taken away by 30,000 tobacco plants, including stems and roots, was equal to 212,488 pounds of stable manure. But as only the leaves are required for the market, the stems, etc., can be given back to the soil.

The leaves of this crop weighed about 6,000 lbs., and contained :—

	lbs.
Nitrogen	274
Phosphoric acid	44
Potash	170

while the remainder of the crop, composed of stems and roots, contained :—

	lbs.
Nitrogen	598
Phosphoric acid	184
Potash	792

Consequently, farmers will readily understand the great value of turning the stems and all the residue back into the soil, as it will supply more than three times the weight of fertilisers which the leaves have taken from the field. This is very important for the tobacco farmer, and he should plough the land immediately after harvesting, so that he may use the roots, etc., as a fertilising material. He should also return the stems to the soil after he has stripped off his tobacco, these being first cut into small pieces and mixed with stable manure, if the latter is available. If, however, the crop had been attacked by disease, which is often the case on the best loose tobacco soils in this country, the stalks and roots should be burnt and the ashes collected and applied to the soil just before transplanting. By burning, the nitrogen is lost, but the potash and phosphoric acid, which are of great value, will be retained in the ashes.

The first ploughing should be deep, and if the land is underlaid with a clay sub-soil, which comes near the surface, it will be necessary to use a sub-soil plough to break up this hard layer, so that a greater feeding surface is supplied to the roots. This will provide better drainage, and at the same time help to retain moisture in the soil during a drought. If the soil is at all rough it should be thoroughly pulverised before planting out the tobacco.

The soil must be kept mellow, moist, and absolutely free from weeds. Sometimes the weeds begin growing under the roots of the tobacco, where they cannot be destroyed by the cultivator. In this case hoeing must be resorted to, and this should be done as soon as the weeds appear. A perfect mulch should be kept on the surface all the time, never allowing it to become hard or crushed, by maintaining such a mulch, moisture is retained in the soil.

Plate No. 54 shows well prepared and cultivated land at our Experiment Station near Pretoria. This land was constantly cultivated, and, as will be seen, the soil is well pulverised and free from weeds.

The number of cultivations after transplanting will depend a good deal upon the season and conditions. It is impossible to state just how often one should cultivate. Usually once a week is not too often. The land should be cultivated just as soon as possible after every shower of rain. The cultivator should have many small teeth in preference to a few large ones. One of the best cultivators for tobacco is the Planet Jnr., although there are, of course, many other makes which are quite satisfactory.

When there is excess of rain on soils of heavy texture, cultivation should not be applied too frequently, for working the soil under these conditions tends to increase its plasticity and tenacious character, leading to the foundation of hard clods.

Thorough cultivation is a most important matter, and I am afraid the majority of Transvaal farmers do not realise this. They appear to be under the impression that all that is necessary is to keep the field free from weeds, and although this must be done, yet the retention of moisture in the soil is even of greater importance.

Seed Beds.

Although there is still ample time for sowing tobacco seed, a few photographs of the seed beds which were made by this division last season and have been successfully used, may be of value.

Plate No. 55 shows our beds at Barberton, season 1906-7.

Plates Nos. 56 and 57 show our seed beds at Skinner's Court, Pretoria, last season. Great care had to be taken in the preparation of these beds, as they were used for raising cigar wrapper tobacco, and this seed only germinates with great difficulty.

As I stated in my previous article, seed beds are generally made too early in the Transvaal, especially in the higher altitudes.

For instance, seed beds made in April and May, which have to resist the cold months of June and July, cannot make any progress in growth if not well protected, and if germination and growth take place in the winter months, the young plants are exposed to the night frosts. Violent irrigation is also very harmful and a principal cause of the many infected plants in the seed bed and in the field. It makes a great difference, however, if one starts at the higher altitudes in the latter end of September and the beginning of October with transplanting, when irrigation is at one's disposal. In this case, of course, the seed must, so to say, be forced by sowing it in well prepared and manured soil, in so-called hot beds made of wooden frames and covered with straw, canvas or oil-paper, which latter is very much to be recommended. By closing these covers overnight the warmth is retained and the germination is also accelerated by keeping the seed bed dark. Watering should be done by hand, at first with an air spray pump (until the plants are about a quarter of an inch high), in order to prevent the strong jets from the watering-can making small canals in the seed beds, and the quantity of water must be carefully controlled.

On some farms I have found seed beds lying below the level of the surrounding ground, so that water was actually led on to the beds. Although this may assist germination, the final results are very harmful.

Often it will be seen that in the centre of the seed beds the seedlings have all died off. The plants have been practically drowned, and the seed

Plate 52. **Field of Cigar Filler and Binder Tobacco.**
(Government Tobacco Station, Barberton.)

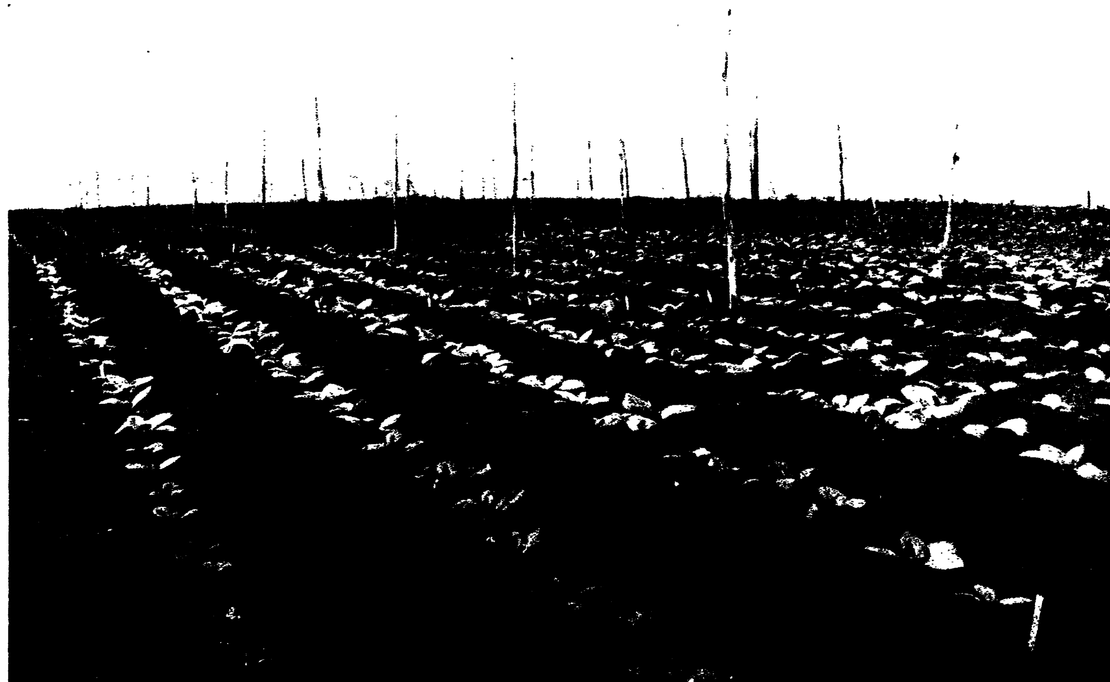


Plate 54.

Tobacco Field under Cheese Cloth.

(Government Tobacco Station, Pretoria.)

Cigar Wrapper Tobacco two weeks after transplanting.

Fig. 1.

Plate 55. Fig. 2.

Tobacco Seed Beds.

(Government Tobacco Station, Barberton.)

Fig. 1. Showing cheaply constructed straw shade covers which are gradually removed.

Fig. 2.—Showing ditches for drainage.

Plate 56.

Tobacco Seed Beds.

(Government Tobacco Station, Pretoria).

Straw Covers removed.

Plate 57.

A Series of Seed Beds.

(Government Tobacco Station, Pretoria.)

Note the grass mats which are put on during the first stages of growth.

has been sown too thickly. But on the edges of the bed where the seedlings managed to obtain sufficient space, air, and light, and were not affected by excess of water, on account of the ground being slightly higher, they did very well.

The better plan is to have the seed beds raised a little above the surrounding ground, so that the water is easily drained off.

* * * *

A good way of preparing seed beds, which may be taken in hand in the early winter, is as follows :—

Choose a spot sheltered as far as possible from the cold winds. Winds dry out the seed beds, and it will be found difficult to keep the soil moist enough for germination and growth. The best soil is a rich sandy loam, containing a rather large percentage of sand and humus. A well worked garden soil is the most suitable, but if this is not available, and only new ground can be had, the latter should first be well worked.

The next step is to mark off the beds. These should be three or even four feet wide, and as long as required ; 50 feet or 100 feet long will be found a convenient size. The beds should then be marked off, with 1 ft. paths as divisions between them. If there is sufficient land available the paths could well be 2 ft. or even 3 ft. wide, so that the beds are easier to get at. The top soil, to a depth of, say, 10 inches, should be removed, and a layer of 5 inches of fresh stable manure placed at the bottom. The soil taken out, after having been mixed with well-rotted stable manure leaf mould, or any other well decomposed vegetable matter, should then be replaced on top. The soil must be pulverised as much as possible.

* * * *

When the beds have been well prepared, as descibed above, they should be thoroughly wetted. Weeds will then appear, and these should be all pulled out before the seed is sown, so that there is not so much weeding to be done after the seedlings have come up. When this has been done, and the bed is quite ready, having been wetted again, the seed should be sown on the wet soil. After sowing, a little pure sand can be thrown over the beds to prevent the caking of the top soil, this also tends to keep moisture within reach of the seed.

The quantity of seed to be sown is an important matter. To raise good, strong, healthy plants it is better to sow too little than too much seed. I consider it advisable to use no more than one ounce of seed for one hundred square yards. In some cases it might be wise to use only one ounce for 150 square yards of soil. The seed, before sowing, must be mixed with about one hundred times of its own weight of fine ashes, mealie meal or fine dry earth. After it has been sown, the seed should be lightly pressed into the soil with a light roller, or by patting down the earth with a wooden plank.

Although at first the seedlings must be protected from the cold at night time and from the hot sun during the day by means of shade covers, the seedlings will soon become stronger and healthier when they are alowed sufficient light, air, and moisture by gradually taking off the shade. The shade afforded must become less and less as the seedlings grow, so as to harden the plants and prevent their becoming weak and long stemmed, and thereby less able to stand the shock of transplanting and to resist disease.

USEFUL FACTS AND FIGURES FOR FARMERS.

THE PULSE.

The pulse is the throbbing of an artery. By it is determined the heart's action and also the condition of the nervous system. In the horse, the pulse is usually taken where the submaxillary artery winds under the lower jaw. By standing at the left side of the horse's head and running the finger gently along the lower jawbone, the artery will be felt just at the front edge of the large muscle at the side of the jaw. In taking the pulse of a cow, the person stands on the left side of the animal, but takes the pulse of the right jaw by reaching over the neck. In the dog and the sheep the pulse is usually taken from the femoral artery, which comes down close to the bone on the inside of the hind leg.

In health, the pulse feels full, round and regular as it throbs against the finger. It varies in frequency in the different animals as follows:—

	Beats per minute.
Horse	30 to 40
Cow	40 to 50
Sheep	70 to 80
Dog	70 to 90

* * * *

The pulse beats more rapidly in young animals than in old. Excitement and exercise also increase its rapidity. The pulse varies not only in rate, but also in quality. The pulse may be "hard"; that is, the artery wall is not easily depressed by the finger. A "quick" pulse is one in which the beat comes up suddenly; but this does not necessarily imply a greater number of beats per minute. In fact, a quick pulse may be an infrequent one. A "slow" pulse is the opposite of the quick, the beat coming up very gradually against the finger. A "soft" pulse is the opposite of the hard. It is easily compressed by the finger. An "irregular" pulse beats unevenly—very rapidly for a time and then very slowly. An "intermittent" pulse drops a beat regularly, as, for instance, if every fourth beat be wanting.

* * * *

The different conditions of the pulse are often strong symptoms of certain diseases. A soft pulse indicates bronchitis; a slow, full pulse, a disease of the brain; and intermittent pulse, heart trouble. An irregular, faint, and fluttering pulse also denotes weak heart action. A hard, quick, bounding pulse usually indicates acute inflammation. By practice the veterinarian becomes very skilful in diagnosing disease by means of the pulse.—("The Care of Animals."—Mayo.)

APPLICATION OF FARMYARD MANURE.

A man will load from 20 to 25 yards of well-rotted dung per day, and from 15 to 20 cubic yards of fresh dung per day, while 15 yards will form a fair day's work for a man to spread from heaps in the field. The

number of horses required will depend on the distance of the manure heap from the field and the state of the roads. If the distance does not exceed one-quarter of a mile, two men loading will probably require three horses and carts, two drivers, and two to three men in the field spreading.

* * * *

Table showing the number of loads required per acre, according to the distance between each heap, and the number of heaps into which each load is divided :—

Distance of heaps apart. Yards.	Heaps per load. Four loads. per acre.	Five loads. per acre.	Six loads. per acre.	Eight loads. per acre.
5 x 5	48	38½	32	24
5 x 6	40	32	27	20
6 x 6	33	27	22½	17
6 x 7	29	23	19	14½
7 x 7	24½	20	16½	12
7 x 8	21½	17	14½	10½
8 x 8	19	15	12½	9½

* * * *

To find the number of loads required for any other distances, divide 4,840 (square yards=one acre) by the product of the two distances in yards between the heaps multiplied by the number of heaps per load. For example:—Required the number of loads per acre, supposing each load to be divided into seven heaps, and the heaps four yards apart; then $4{,}840 \div 4 \times 4 \times 7 = \frac{4840}{112} = 43\frac{1}{4}$, the number of loads required.—("The Agricultural Surveyor and Estate Agents Handbook."—Tom Bright.)

TESTING "HIGH CLASS" GUANO.

(a) Colour should resemble that of coffee and milk. If too grey, it is earthy ; if too brown, it contains an excess of water.

(b) Taste.—Strong, salt, piquant, caustic.

(c) Smells strongly. Varies with degree of dampness. (The strong smell of damp guano is due to carbonate of ammonium).

(d) Consistency.—Oily to the touch. In small grains, though sometimes adhering in large pieces. If rich in urates, will appear shining and crystallised when broken across.

(e) Flame.—Will blaze up quickly, if good, and leave residue of charcoal ashes. There is less charcoal in guanos poor in organic matter.

(f) Mixed with quicklime, ought to give strong evolution of ammonia.

(g) Weight about 60 to 70 lbs. per bushel.

—(" Agricultural Notebook."—McConnell.)

HOW TO ADJUST A PLOUGH.

Hitch the team as close to the plough as possible, and hitch to the lowest hole in the clevis. Start the plough and note whether the furrow is sufficiently deep; if not, hitch higher, one hole at a time, until the plough cuts at the right depth. If the furrow-slice is turned over flat,

and a lap or rolling furrow is desired, it may be because the furrow is too wide in proportion to its depth ; to correct this, the clevis must be moved to the left. If the furrow stands too nearly on edge it is narrow in proportion to its depth; move the clevis to the right. A plough that is properly adjusted should run in the soil for some distance without being held, cutting a furrow of even depth and width, provided the soil is free from stones and other obstructions. If it will not do this either the plough is a poor one, or, what is more likely, it is not correctly set up or adjusted. When it runs all right, lower the beam wheel until it just touches the surface. Thus adjusted, the plough will do its best work as easily as it can be made to run.—("Soils."—S. W. Fletcher.)

TO PROTECT PEAS AND BEANS FROM RATS, MICE, AND BIRDS.

Damp the seeds slightly, then place them in a shallow dish, and sprinkle lightly with an incrustation of red lead in powder, stir with a stick until all the peas are coated with the powder, then sow in the ordinary way, using an old glove to keep the hands free of the powder. When the succulent shoots are attacked above ground by birds string black cotton along the rows several inches above the growths; five or six lines of cotton will be ample, and should be supported at intervals along the rows by means of short sticks or curved pieces of board, with nails driven in at intervals whereon to attach the thread.—("The Horticultural Notebook." —Newsham.)

FATTENING CHICKENS.

The following is the Canadian fattening experience boiled down in a practical way:—The most profitable period for fattening is four weeks. Don't overfeed the first week. Remove food left over. After first week give them all they will eat. Feed twice a day. Grain should be ground very fine. Skim milk makes flesh and whitens it. Use a little salt, and supply water and grit. Feed tallow the last ten days, mixed hot with ground grain, beginning with one pound tallow to seventy or one hundred fowls, and increasing to one pound for fifty to seventy. Kill lice with sulphur rubbed under wings and tail. The feeding machine will increase the gain the last ten days, but should not be used longer. Stuff only when the crop is empty.

FATTENING TURKEYS.

The methods of English turkey fatteners, as described by E. R. Brown, include several good suggestions. About five weeks before killing, the turkeys are put up to fatten in a dry, comfortable shed, which must be large enough for the number of birds accommodated. Then the northern and eastern sides of this shed should be well closed in, but the southern and western sides may be wire-netted, thus affording the inmates plenty of fresh air. Broad perches are provided, and must not be more than three feet above the ground. Food and water are placed in troughs conveniently situated, and away from the perches.

When shut up to fatten the turkeys are given all the food they will eat. The morning feed consists of barley meal and wheat meal. Some farmers who are very particular and have good customers mix the meals with milk, and give milk to drink instead of water, an inexpensive addition if skim milk is used, and one which considerably improves the flesh. Cooked potatoes can also be added to soft food with advantage, and this applies to all fowls put up for fattening. The afternoon feed consists of whole barley, oats and a little maize, which are more easily digested if steamed in hot water. When fully satisfied all food should be removed, the troughs emptied and washed after the morning meal of soft food.

* * * *

In every case there must be a plentiful supply of coarse grit and sand available to the fowls, and a little slacked lime or old mortar will be an improvement. Without grit the turkeys cannot possibly digest their food properly, and without effective digestion flesh production will never be complete. Should any of the turkeys fight the culprit must be removed. Turkeys can be crammed by machines, as are fowls.—("Poultry Feeding and Fattening."—George B. Fiske.)

TO PRESERVE WOODEN LABELS.

Preservative.—Soak the labels in a weak solution of creosote. Large labels may be painted white, and the points dipped into boiling tar, and afterwards sprinkled with dry sand or coal ashes. Another good remedy is to soak the labels in a solution of sulphate of iron, allow to dry, then soak thoroughly in a strong solution of lime water. The insoluble sulphate of lime thus formed in the tissues of the wood prevents rotting. —("The Horticultural Notebook."—Newsham.)

TEMPERATURE.

The temperature of animals is taken by means of a self-registering, clinical (fever) thermometer, inserted into one of the natural openings of the body, usually the anus or the vulva. The thermometer should always be shaken down before using, and allowed to remain in the body at least three minutes. The temperature of animals in a state of health ranges as follows:—

	Degrees Fahrenheit.
Horse	100 to 101
Cow	100 to 103
Sheep	101 to 103
Dog	101 to 102
Pig	102 to 104
Fowls	107 to 108

A rise in temperature, commonly called fever, denotes inflammation and a rapid oxidation of the tissues of the body. A rise in temperature of six degrees or more is likely to be dangerous, unless it is caused by some local condition that is soon removed. In disease, a rise of four degrees

is serious. A sudden fall of temperature below normal, unless due to some local cause, is always serious, and usually denotes waning vitality and the approach of death. A person who takes care of much stock should equip himself with a good clinical thermometer and familiarise himself with its use. He will find it a valuable aid in recognising disease.—("The Care of Animals."—Mayo.)

SIZE OF FARMS IN THE UNITED STATES OF AMERICA.

The total number of farms in the United States in 1900 was 5,739,657. The total area of these farms was 841,201,546 acres. The average area per farm was 146.6 acres, and the averge number of improved acres per farm was 72.3.

Classes of Farms.	Number of Farms.
Under 3 acres	41,882
3 acres and under 10	226,564
10 " " 20	407,012
20 " " 50	1,257,785
50 " " 100	1,366,167
100 " " 175	1,422,328
175 " " 260	490,104
260 " " 500	377,992
500 " " 1000	102,549
1000 " over	47,276
Total	5,739,657

In the Transvaal there are 11,630 registered farms, and the average size is 5,000 English acres approximately.—(EDITOR "T.A.J.")

EXTRACTS FROM EXCHANGES.

THE HOMESTEAD ACT IN AMERICA.

(*Agricultural Economics.—Taylor.*)

The Homestead Act of 1862 was the final step in the direction of free land for actual settlers. This law was the result, in part at least, of the agitation of the Free Soil Democrats. They claimed "that the public lands of the United States belong to the people, and should not be sold to individuals, nor granted to corporations, but should be held as a sacred trust for the benefit of the people, and should be granted in limited quantities, free of cost, to landless settlers."

The Homestead Law enables the landless farmers to secure a quarter-section, viz., 160 acres, of land, and acquire a title to the same by maintaining residence thereupon, and improving and cultivating the land for the continuous period of five years.

"The Homestead Act," says Donaldson, writing in 1880, "is now the approved and preferred method of acquiring title to the public lands. It has stood the test of eighteen years, and was the out-growth of a system extending through nearly eighty years, and now, within the circle of a hundred years since the United States acquired the first of her public lands, the Homestead Act stands as the concentrated wisdom of legislation for the settlement of the public lands. It protects the Government, it fills the States with homes, it builds up communities, and lessens the chances of social and civil disorder by giving ownership of the soil, in small tracts, to the occupants thereof. It was copied from no other nation's system. It was originally and distinctively American, and remains a monument to its originators."

Under the Homestead Law 233,043,939 acres had been entered up to June 30, 1904.

METHODS OF MILKING.

(*The Field.*)

The success of the milker is dependent upon the attitude of the cow. If she is of a nervous temperament, there may be periodical difficulty in getting her to part with her milk. It may be assumed if the cow is a willing party to the operation there is little practical difference in any of the methods of milking.

How frequently, for instance, has the milker to rise and proceed to another cow, afterwards returning to the refractory animal in the hope that she will part more willingly with her milk. Quick milking has this advantage, that, once started, the period of milking is not long. It will be found in practical experience, however, that quick milking is only possible where the cow is a willing party or where the yield is small—a cow perhaps drying off. One objection to very rapid milking is that a considerable quantity of the milk misses the bucket. That, at all events, is the complaint of many practical farmers. No doubt this is dependent upon the height of the cow from the ground, and not least of all upon the length of the teat. Take the case of a modern Ayrshire or Jersey and, say, a cross-bred Shorthorn. One of the great faults of the Ayrshire cow is that the teats are so small that milkers grumble through inability to handle them. When the cow refuses to let her milk down the evil of small teats is most apparent. They are purely a product of the show

yard, and one, it may be added, which breeders and dairymen would gladly sacrifice for the less artistic but more useful teat that fills the hand. Jersey fanciers are following on similar dangerous lines. Jersey judges have been heard to declare that one of the faults of a cow was that her teats were too big!

The folly of such a view is all too apparent when the mischief is done. I would strongly advocate the sacrifice of appearance for a point of practical utility. The big Shorthorn, on the other hand, with good hand-filling teats, is always a favourite; but cows too long in the leg are not favoured by the rapid milker.

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If the milker can milk ten cows in the hour he does well. Usually in a herd the calving dates are so arranged that the lactation is uniform, save in the winter time, when perhaps a dozen cows may be milked by a good milker in the hour. Obviously, however, it depends upon the breed and the time of the year, the milking in the nature of circumstances being heavier in the summer time, when the pastures are at their best.

An experiment to demonstrate the value of expert as against inexpert milking was carried out at the Ontario College lately. That experiment shows that the most satisfactory yields were obtained by expert hand-milking. The inexperienced milker generally drew from one pound to two pounds less at a day's milking than the careful operator. On a herd of sixty cows in milk this means about nine gallons a day lost through slovenly milking.

ON THE COLOUR OF SOILS.

(*Soils.—S. W. Fletcher.*)

The colour of a soil is often some index to its agricultural value, and has an important influence on its temperature. A dark-coloured soil is usually warmer and earlier than a light-coloured soil. All dark substances absorb more of the sun's rays than light substances. That is why we wear light-coloured clothes in summer, and partly why snow melts faster on the dark-coloured, ploughed ground than on the meadow. In Switzerland farmers sometimes hasten the disappearance of the snow by strewing it with black, powdered slate. Gardeners sometimes sprinkle a light-coloured soil with peat, charcoal and bog mould; these are called "sun traps." Melons are ripened in Saxony with the aid of a layer of coal dust. But although colour has an important influence on the power of a soil to absorb heat, it has not ability to retain heat. Schubler states that, other things being equal, a dark-coloured soil is about 8 degrees warmer near the surface than a light-coloured soil.

This difference in the temperature of soils, due to colour, may have a marked influence upon the growth of a crop, especially on its germination. When earliness is a prime consideration, as it is with most market-garden crops, the colour of a soil may become very important. Dark, sandy loams, rich in humus, are preferred by market gardeners. Light-coloured soils may be made dark by filling them with humus. Two or three green-manuring crops ploughed under will darken a light-coloured soil quite noticeably. I have a neighbour who, in three years, has transformed a poor, yellow soil into a black, retentive and productive loam by ploughing under four inches of composted manure every fall. Another neighbour, under similar circumstances, has accomplished nearly as good results by ploughing under muck drawn from a near-by swamp. The chief reason for adding humus to a soil is to improve its texture, but another benefit, and one that is often quite important, is to improve its colour.

DIARY FOR THE GARDEN.

By Alex. H. Stirrat, R.H.S. (Lond.), Superintendent of Parks, Johannesburg.

May.

This and the two following months may be described as the winter of the Transvaal, and so it often happens that those people who have gardens give them no care, but rather leave them to look after themselves, with the result that when the spring approaches there is a hundred and one things to be done at once. It is therefore imperative that at this time of the year constant attention be given to such matters as trenching, pruning, planting.

The preparation of the soil and the protection of the more tender plants during the severe winter, the care of seed beds, and the lifting of late crops, are just some of these items. After a general clearing up of the whole ground, removing all useless stuff to the rubbish heap, active measures may be taken to meet the wants of the coming season.

Where the frost is exceptionally keen, as in many parts of the Transvaal, tender herbs, such as parsley, etc., may be provided with some covering, such as hoops placed over the young plants in readiness to throw sacks over them in the event of severe frost.

It is an advantage to keep all the cabbage family free from decayed leaves. Numerous plots of land will doubtless be vacant, and manuring may now be done (when the soil is heavy and the material to be burned is rank). Trenching and digging also. Ridging land, especially when heavy, is a means of purifying and improving its quality.

Where the land is sheltered and well watered, such vegetables as parsnips, turnips, lettuce, cabbage, cress, beet, etc., may be sown. Young cabbage recently transplanted will require to have the soil loosened between the rows and given a plentiful supply of water.

In the flower garden much will require to be done. It is also quite safe to plant almost any variety of tree and shrub. Needless to say, deeply trenched ground is of advantage to all newly planted trees and shrubs. My advice always is to plant less and to do it well rather than to skip and scamp the work.

June.

With many growers at this period of the year there is a general summing up. New vegetables have been tried, and the results noted; stock seeds are looked over, and perhaps laid up for a more extensive trial next season. Those of an unreliable sort should be dispensed with altogether. Your seed store should now be thoroughly cleaned.

The sowing of vegetables is a difficult matter at this season of the year unless the ground to be planted has been well irrigated, or a plentiful supply of water is at the command of the grower.

Attention may be directed to the herbacious and flowering borders. When planting let the roots extend out freely, and take care to cut all the

roots clean where there were any breakages. Work all the soil nicely about the roots, spreading out the young fibrous roots with the hands, while gently pressing the soil during the process of filling in. I have found that sharp sandy soil introduced next to the young roots is advantageous in promoting an early growth.

When any watering is done see that the plants gets a thorough soaking, not merely moistening the surface soil.

JULY.

The following vegetables may now be sown (but in all cases a sheltered position must be selected at this period of the year) :—Onions, raddish, shallot, beet, cabbage, broad beans, parsnip, lettuce, spinach, celery, etc. In this month's notes I wish to speak of the cultivation of celery. The seed may be sown in boxes or specially prepared beds, having some protection handy for the young plants during the frosty nights. If sown in beds the plants when large enough may be planted out in their permanent places straight away. When grown for ordinary purposes, and provided the ground is moist, the plants may be planted in the open ground in the ordinary manner in rows, about 6 inches apart. But much the better plan is to plant out into specially prepared beds or trenches ; thus better and stronger plants can be secured. The beds can be dug, say, 9 inches deep, and the soil placed on the sides of the trench and levelled. If desired, a small crop of kidney beans, etc., may be planted there and grown without detriment to the celery. The beds should then be liberally supplied with well rotted manure, cow dung for preference, and the land thoroughly trenched. The width of the beds can be any convenient size, and the young plants planted, say, 9 inches apart, with 1 foot between each row. The young plants should be well watered on planting, and the soil loosened between the rows until they have become thoroughly established. The best celery has clean and well blanched heads, stalks solid and free from blemish and insect injuries, and uniform in growth.

In growing celery for competition it is necessary to have a trench dug, say, two and a half feet in depth, and, say, three feet in breadth. The bottom of the trench to be filled up with one foot of good cow manure and the second foot composed of well rotted manure and covered with good rich garden soil. Here two rows of celery can be planted, each row 9 inches from the edge of the excavation, and the plants 15 inches apart.

When the young plants have become established it is best to have them earthed up, but before doing so I have found it an admirable plan to have collars made of stout cardboard, about 9 inches high, placing them around each plant, thus inducing the plant to draw up. As soon as the plant grows to the height of the collars the inside of the collar is filled with sawdust, leaving the crown of the plant free to continue growing. This results in the celery stalks being blanched, of good colour, and free from insect pests, which rarely penetrate the sharp sawdust. The process of earthing up is continued gradually, care being taken not to injure the tender plants. The collars are then pulled up until the required depth is reached.

CORRESPONDENCE.

This column will be devoted to correspondence, and an endeavour made to reply to all inquiries upon agricultural topics, or concerning any of the articles published from time to time in the "Journal."

Correspondents will kindly write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the "Agricultural Journal," Department of Agriculture, Pretoria.

PASPALUM OR BREED-ZAAD.

A correspondent writes :—

"Can you give me any information about Paspalum grass, whether it has been grown in this Colony and with what success ?"

Answer.—This grass has been widely tested almost throughout the Transvaal, and as a rule it gives most satisfactory results, more particularly on the damper soils along spruits and in vleis. It is a nutritious grass, and is well liked by stock; unfortunately, it is sensitive to frost, and is therefore of no value for midwinter grazing. It begins growth very early in spring, however, before the native grasses start to shoot, and also lasts green longer into winter than the common veld grasses ; it is therefore particularly useful for spring and autumn grazing, while during summer it may be grazed or cut for hay, although for the latter use it is somewhat coarse and succulent.

J. BURTT-DAVY,
Agrostologist.

POISONOUS PLANTS.

A correspondent asks for information about two plants supposed to cause sickness in sheep.

Answer.—1. "Klaver." This is *Trifolium africanum.* It is a favourite food of some stock, and is not at all likely to be the cause of any more serious trouble than hoven or opblaas, which is even more likely to be produced by green lucerne and other succulent forage.

2. "Vermeer-bosje." This is a species of Geigeria (family Compositæ). We have no previous record against it, but a nearly-related species was recently sent from Bechuanaland with the information that it is considered by farmers to be poisonous to stock in the disricts where it grows.

J. BURTT-DAVY,
Government Botanist.

NOXIOUS WEEDS.

A correspondent sends specimens of a weed which is over-running his garden, and asks its name and how it can be eradicated.

Answer.—This weed is ***Euphorbia sanguinea***, an annual species, native of Tropical Africa, which is spreading rapidly in the Transvaal. It

propagates by seeds, which are produced early and during a long period. The most successful treatment is frequent hoeing up and burning of the plants before seed is formed; this may take two or three seasons to complete, but if thoroughly persisted in cannot fail to succeed. For paths and walks we would suggest the use of a strong solution of salt and water or dilute sulphuric acid, applied wherever the plants appear; but this should not be used on a lawn or flower bed.

J. BURTT-DAVY,
Government Botanist.

MEDICINAL PLANTS: JERUSALEM OAK.

A correspondent sends specimens of a weed from the Wolmaransstad District, supposed to have medicinal properties.

Answer.—The specimen sent is *Chenopodium Botrys*, L., an alien plant naturalised and spreading over the Transvaal. It is commonly known as "Jerusalem Oak."

It possesses anthelmintic (good against intestinal worms) properties, and is nearly related to *C. anthelminticum*, which produces the worm-seed oil of the United States pharmacopœia. Jerusalem oak is also said to have been used with advantage in France, in cases of catarrh and asthma.

In Baluchistan the young leaves are a favourite kitchen vegetable.

J. BURTT-DAVY,
Government Botanist.

GRASSES AS DAM-BINDERS.

A Middelburg correspondent writes to know if he can sow any grass seed that will bind the earth of his dam.

Answer.—The best grass for this purpose would be the Bermuda Kweek-gras or Op-regte Kweek-gras (*Cynodon dactylon*), which can now be found in practically every district in the Transvaal. The Transvaal Kweek-gras (*Cynodon incompletus*) is not so useful for the purpose. The best plan is to plant out root-cuttings or sets, during a spell of continuous rainy weather; under favourable conditions, nearly every cutting put into the ground will root.

J. BURTT-DAVY,
Government Botanist.

BUILDING OF CREAMERY.

To the Dairy Expert.

Sir,—I am just about to start building a small dairy. I should be glad if you would give me a few practical hints which you think would make a successful dairy. I hope soon to have 30 cows. I intend making my building 16 ft. long by 14 ft. wide by 8 ft. high, building it with stone 18 in. thick, so that the inside measurement will be 13 x 11. I have some nice stone here, but I have to bring it a long distance. I do not

want to make it too expensive. I have an Alfa Laval separator and Hathaway churn. What do you think would be the best way to build it to keep it cool as regards the doors and windows, and also what sort of floor should I put in?

Yours, etc.,

Natal Spruit. E. A. BIRDSEY.

Answer.—The building you suggest may answer your purpose, but you should take care to cement the walls on the inside. For a floor I would use stone, well cemented over.

A good thing will be to surround your dairy with trees to keep it cool and shady. Select a fresh, airy place—if possible, high. For a roof thatch will be the best material. Plenty of ventilation should be provided by means of windows and in the roof. The windows to be small and the outside covered by fine wire gauze to keep insects out when the windows are open.

To the machinery you mention I would add a good butter-worker, obtainable in Johannesburg and Pretoria. I hope shortly to publish a leaflet on butter making, which may be of use to you.

ROBERT PAPE,
Superintendent of Dairying.

ON BUTTER MAKING.

A correspondent, Mrs. W. A. J. Mallandain, asks a remedy for rancidity in butter.

Answer.—Rancidity may be caused in different ways. Frequently it is caused by some error in the treatment. I should not advise the use of brine in making butter, as I find that the superior qualities are always prepared with dry salt. The amount of salt used depends entirely on the requirements of customers. I have handled entirely saltless butter, and, on the other hand, I handled butter containing 5 or 6 per cent. of salt. You will find it beneficial to obtain a pure, dry, fine salt for mixing with your butter. The particles of the salt should be of a regular size, about 1-25th in. in diameter. After draining the freshly made butter and a preliminary working to expel some part of the butter-milk, the salt should be added and worked in by means of the roller.

Then the butter should be kept for a considerable time, say, six or eight hours (this varies according to circumstances), in a dark, cool place, preferably at 10 deg. Centigrade (50 deg. F.). This gives time to form brine and spread evenly through the butter. The second working expels the butter-milk and superfluous brine.

Now the butter should be placed in the cool space again till it feels fairly solid, after which it can be made up in pats and packed for despatch.

To prevent rancidity, milk, cream and butter should be exposed as little as possible to sunlight or daylight; a reddish or yellow light is generally considered the best, though I must say I seldom see this applied in practice.

In your case I should keep the butter after packing in a dark, well ventilated, but cool place, preferably 5 deg. Centrigrade (about 40 deg. F. if obtainable), the butter to stay there at least 24 hours before despatch.

ROBERT PAPE,
Superintendent of Dairying.

EXPERIMENT IN DRY LAND FARMING.

To the Editor of the Agricultural Journal.

Sir,—It will interest your readers to learn of the following experiment made in connection with your article on dry land farming in your issue of January, 1907 :—

Mr. Kahts, a farmer residing in this neighbourhood, having read your article, decided to give it a trial. He selected a morgen of ground, of a poor, sandy loam, on the side of a hill, ploughed it in January to a depth of 6 in.; then during the rains of February and March he harrowed it repeatedly with a medium weight harrow. In the beginning of April he sowed three-fourths of the area with "Holstrooi" wheat, and in May he sowed the remaining portion also with wheat; using in all about three-eights of a bag. From his April sowing he reaped no result, as it was destroyed by locusts. From his May sowing he reaped six bags from less than a bucket of wheat and a little more than half an acre of ground. Mr. Kahts considers this a fair crop from such poor soil. It is worthy of note that the sub-soil received no special treatment in the way of packing, and that the crop after sowing received no further treatment. I saw the crop before reaping, and it appeared in every respect equal to the "vlei" grown crops in the neighbourhood; and, besides, had not been injured by frost as many of the latter were.

In conclusion, I may add that the experimenter is highly pleased with the result of his test, and proposes trying the experiment on a larger scale next year.

Yours, etc.,

Putfontein, Lichtenburg. S. HEMINGWAY.

EAR MARKS—CHEEK BRANDS.

To the Registrar of Brands.

Sir,—I should esteem it a great favour if you could offer some suggestion as to the best method of ear-marking sheep, as at present the sheep purchased by me from various owners are marked in three or four different ways; whereas I should like to use some particular mark in the shape of a punch instead of a knife, which is the common practice.

Yours, etc.,

Standerton. GEORGE GRAY.

Answer.—I would recommend a cheek brand instead of an ear-mark. My reasons for making this recommendation are:—

1. Let us presume your ear-marking plier represents AG. Once a swallow-tail or other similar mark is placed on an ear, it would be useless to punch your G on the same ear, as in such a case any other person or a court of law would invariably hold that the owner's mark is a swallow tail and a G, which practically means that the animal does not bear your brand.

2. One always has to catch sheep, especially merinos, in order to ascertain the kind of character composing the mark. The police and poundmasters often experience the greatest difficulty in finding out the letter or symbol an ear-mark represents.

A cheek brand when neatly imprinted on the cheek of an animal could be recognised from a distance. Some of the Zoutpansberg farmers have obtained cheek brands corresponding with their great stock brands, and, according to reports, these answer well.

The use of a cheek brand, of course, does not debar one from the use of ear-marking pliers consisting of similar characters. Should you care to obtain ear-marking pliers as well as a cheek brand, then you may ear-mark your natural increase, and when you buy sheep bearing an ear-mark brand them with the cheek brand.

To obtain a cheek brand or ear-marking pliers your plan would be to first apply to the Resident Magistrate of Standerton to register a brand in your name, and then apply through the Resident Magistrate or direct to this office for the required instruments, which will be made according to your registered brand.

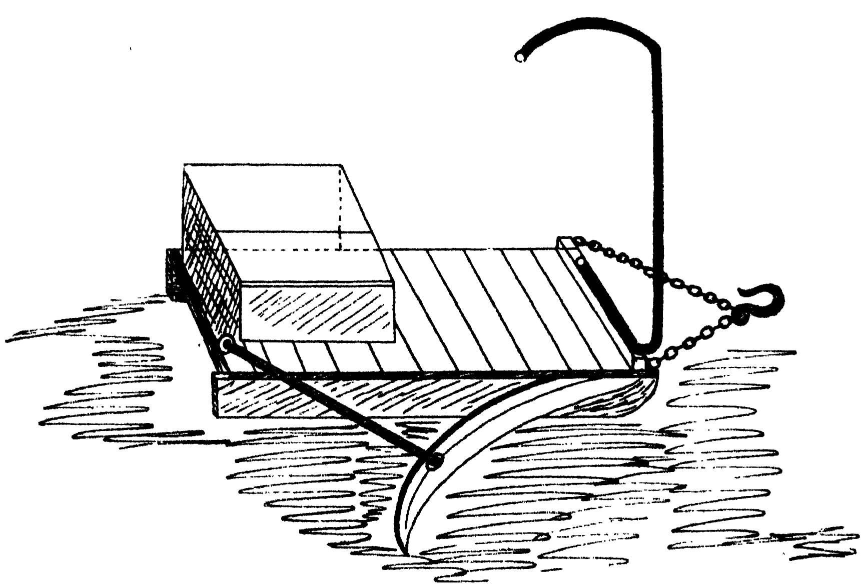
I presume you are aware that the first character of every registered brand denotes the district where the brand is to be used. The remaining characters, *i.e.*, a letter and a numeral, may be selected by the applicant. The first character of every brand in the Standerton District is S. I would advise you to register S1G.

J. J. PIENAAR,
Registrar of Brands.

USEFUL FARMING IMPLEMENT.

To the Editor of the Agricultural Journal.

Sir,—As a keenly interested reader of the *Journal*, it struck me that you might care to publish a cut of a small implement which would be of service to the small farmer. As you will see from the rough sketch it can easily be made by any handy man, and to give practical demonstration of it I made one up during the holidays out of odds and ends lying about my stable. It is an implement much used in Australia, and one man, with a mule, can easily cut from seven to eight acres per day. Of course if the maize is sown broadcast only a third of the amount could be cut.



The sledge is made of 3 x 2 decked with inch stuff. An old scythe blade is fastened securely to sledge at an angle of 45 deg. with chain in

front for draft. The driver holds reins with left hand and guides the fall of stalks from bent bar with his right hand. A paraffin or fruit case is used for a seat.

Yours, etc.,

Pretoria. W. A. JONNES.

AMERICAN BLIGHT ON APPLE TREES.

To the Director of Agriculture.

Sir,—I have a small orchard, and my apple trees are affected with a white woolly blight, which resembles cotton wool. I should be much obliged if you would advise me what to do to get rid of it.

Yours, etc.,

CHARLES STUART.

Parktown, Johannesburg.

Answer.—The insect to which you refer as forming a cottony growth upon the apple trees is what is known as American blight or woolly aphis (*Schizoneura lanigera*). This aphis has two forms; the one lives on the roots of apple trees, while the other lives upon the branches. The form upon the roots is very difficult to eradicate; in fact, it is practically impossible to do so. The form upon the branches of the trees can be kept in check by spraying, but the upper parts of the trees will be continually reinfested from the insect on the roots, if these are present.

I should advise you to examine your trees, and if you find the roots infested, dig up and burn the trees. You will easily recognise the insects upon the roots of the trees by the large knotty swellings.

After digging up the tree the hole should be burned out thoroughly, and then, after an interval of a few months, a new tree may be planted. This new tree should be budded upon Northern Spy stock, a stock which is resistant to the attacks of woolly aphis. This new tree will not be affected on the roots, and the branches can easily be kept clean with suitable treatment.

A spray of paraffin emulsion, made up according to the enclosed formula, if applied carefully, will be effective in destroying the aphis. Some people prefer to prepare a torch, by soaking a rag in paraffin and tying it to the end of a stick, and when this is lighted moving it quickly along the infested portion of the tree, thus burning the insect without injuring the bark of the tree. In the Transvaal one frequently hears of very absurd remedies for the treatment of this pest, such as burning a hole in the trunk of the tree and pouring in a quantity of paraffin, and then filling up the hole again. Such remedies are absolutely worthless, and may do considerable injury to the tree.

C. W. HOWARD,
Entomologist.

FORMULA FOR THE PREPARATION OF PARAFFIN EMULSION.

The paraffin emulsion is made up as follows:—

Hard Soap	1¼ lbs.
Paraffin	4 galls.
Water	2 galls.

Cut the soap into small pieces and boil until dissolved in the water. Add the boiling solution to the paraffin and at once churn the mixture, and keep it violently agitated for ten minutes; five minutes may suffice if a small hand pump is used to pump the liquid quickly back and forth. When it can be done without danger of the oil taking fire it is well to heat the oil beforehand, or to keep the mixture over the heat while it is being agitated. A uniform milky emulsion is thus produced, which becomes semi-solid on cooling. When properly made the emulsion will keep for a long time. It is dissolved with from nine to fifteen parts of water, depending upon the tenderness of the plants.

The water and the emulsion must be thoroughly mixed. Soft water should be used both in preparing the emulsion and for diluting it.

ARTIFICIAL MANURES.

To the Director of Agriculture.

Sir,—I shall be much obliged if you will advise me what kind of artificial manure to use on my lands for wheat and oats. The soil is a heavy, very sticky, dark reddish loam.

Yours, etc.,
E. MUHL.

P.O. Kroondal, Rustenburg.

Answer.—After ploughing and cleaning your land give a dressing of 400 or 500 lb. of white lime per acre as top dressing, and lightly harrow it in. After rain or irrigation has distributed the lime through the soil, apply 200 lb. per acre of superphosphate (37 to 40 per cent. soluble phosphates) or 100 lb. per acre of "double superphosphate," and again harrow lightly. Then sow your seed; when the plants are well up, say three weeks or so after sowing, apply as top dressing about 100 to 200 lb. per acre of nitrate of soda.

A better plan, though more troublesome, would be to apply 50 or 100 lb. nitrate of soda three weeks after sowing, and an additional 50 or 100 lb. of the same substance about six weeks later.

White lime of good quality can be obtained from the Godwan River Lime Kilns, on the Delagoa Bay line, and would cost, I suppose, about 5s. or 6s. per bag.

Forty per cent. superphosphate you could get in Pretoria at 12s. 6d. per 100 lb. bag or from Durban at about £5 5s. per ton, plus railage. Nitrate of soda in Pretoria is listed at 28s. 6d. per bag of 100 lb., but at Durban can be bought for £12 10s. per ton. Thus I fear the cost of manures would be somewhat high if you adopted the plan I suggest (amounting possibly to about £4 per acre), so it would be well to at first try on a few acres only, and see whether the increase in crop will pay for the cost.

Of course it might be advisable to alter the treatment in your case. Thus, if your soil is rich in lime (which I do not think probable), the liming might be omitted, so, too, if your soil be rich in nitrogenous organic matter, you could leave out the nitrate of soda. These are points which I must leave to your judgment; but, broadly speaking, I think that lime, phosphoric acid, and nitrates in the order named are most likely required.

HERBERT INGLE,
Chief Chemist.

FERTILISERS FOR ROOT CROPS AND TREES.

A correspondent asks for a receipt for a manure suitable for root crops and another suited for trees on the average Transvaal soils. The reply which was made to this inquiry may be of interest to some of our readers, and is therefore quoted here :—

You doubtless realise that the most appropriate manure in any particular case depends mainly upon the composition of the soil, and that even in the Transvaal we get considerable diversity of soil. However, there is a general lack of phosphates, lime and nitrogen in our soils, and this consideration would probably be the only safe guide in framing a universal manure.

For root crops, *e.g.*, potatoes, beets, etc., I think the main objects to be kept in view are to supply phosphates, lime, nitrogen, and (in order to provide for the few soils which are deficient in that substance) potash. While, in order to lessen cost of transport, the manure should be fairly concentrated.

Such a mixture might be made from :—

		lbs.
(a)	Basic slag	1,000
	Nitrate of soda	300
	Sulphate of potash	300
	Ground quicklime	400

Use at the ratio of 300 to 600 lbs. per acre.

Such a mixture would be particularly suitable to soils poor in lime and rich in organic matter.

On soils rich in lime and even on many of the " black turfs " a quicker acting manure would be:—

		lbs.
(b)	Superphosphate (37 per cent.)	1,000
	Sulphate of ammonia	500
	Sulphate of potash	500

Use at the rate of 200 to 400 lbs. per acre.

If bonemeal be readily available, the substitution of 500 lbs. of this for 500 lbs. of the basic slag or superphosphate would be an advantage.

In either case the manures should be applied to the ploughed land as top dressing and lightly harrowed in before planting.

In preparing the mixture, the materials should also be separately ground as fine as possible and then intimately mixed, finally passing the mixture again through the mill or disintegrator.

When mixture (b) is used it would be well to always recommend the previous dressing of the land with slaked lime at the rate of about 400 lbs. per acre.

For trees, I think that basic slag would probably be the most generally applicable, with perhaps a very little nitrate of soda and sulphate of potash. Say a mixture of :—

		lbs.
(c)	Basic slag	1,500
	Nitrate of soda	250
	Sulphate of potash	250

About 2 lbs. of this mixture to be well mixed with the soil in each hole in planting out, or subsequently applied at the rate of 300 lbs. per acre as top dressing and ploughed or harrowed under, best in the spring or early summer.

To summarise, the following are what I think would prove generally useful :—

1. For Root Crops.

(a) On soils poor in lime :—

	lbs.
Basic slag	500
Bone dust	500
Nitrate of soda	300
Sulphate of potash	300
Ground quicklime	400
	2,000

(b) On soils rich in lime :—

	lbs.
Superphosphate	500
Bone dust	500
Sulphate of ammonia	500
Sulphate of potash	500
	2,000

2. For Trees.

(c)

	lbs.
Basic slag	1,500
Nitrate of soda	250
Sulphate of potash	250
	2,000

Note.—In the case of mixtures containing nitrate of soda, it would be well not to prepare any large quantity at a time, since, on keeping, especially in a damp atmosphere, there would be a tendency for the materials to cake together owing to the absorption of moisture by the nitrate of soda.

HERBERT INGLE,
Chief Chemist.

EDITORIAL NOTES.

Exportation of Maize from South Africa.

On the 7th and 8th of January an epoch-making meeting was held in the Government Buildings of the Capital. It was attended by representatives of the Government Railways, the Agricultural Departments, and other officials. The Chairman on this notable occasion was Mr. T. R. Price, General Manager of the C.S.A.R. The delegates came from the Cape Colony, Natal, Orange River Colony, Portuguese Territory and the Transvaal; and their purpose in thus gathering together was to settle various details in connection with the export of maize from South Africa, and, as far as possible, to definitely decide upon a common plan of action.

* * * *

The Premier's Welcome.

The Right Honourable, the Prime Minister, in opening the Conference said he was delighted to be in the position of welcoming to Pretoria the Members of the Conference in the name of the Transvaal Government. General Botha expressed his gratitude that the other Governments had so willingly accepted the invitation of the Transvaal. The work for which they were called together was most important. It was not only a work for one Colony, but it was a work for the whole of South Africa, and was therefore important in many respects. He believed that this was the first Conference that had been held with the view of ascertaining what *South Africa could export*. A great deal had been spoken with regard to unification and federation, and there was certainly no better step in that direction than to get all the delegates of the different Colonies together so that they could show their willingness to give to each other the hand of brotherhood and so work together for the good of South Africa.

* * * *

In the work for which they were met together absolute unanimity was essential, since it was necessary that the exportation of mealies should be done by all the Colonies. He hoped that special care would be taken to adopt the same grade for mealies in the different Colonies. Further, he trusted that they would all have the manliness when the public sent mealies which were not of the best quality to tell them plainly that there was no market for such. He again desired to welcome them, and hoped their sojourn would be very pleasant. Whenever the services of the Transvaal Government were required he was glad to say they would have pleasure in doing everything in their power to assist them.

In the pages of this periodical it is not possible for us to do more than to merely glance at a few of the decisions. For a fuller account, we would refer our readers to the minutes of the Conference. The debate opened with a discussion on the question of changing the term "Mealies" to "Maize" to correspond with the name under which this class of produce is now known throughout Europe. And: *It was resolved that the policy to be pursued was to encourage as far as possible the use of the word "Maize"; and that in all invoices, and consignment notes, as well as in bills of lading, this traffic be referred to as Maize.*

Maize or Mealies.

* * * *

We are glad that the Conference took up this position. For although there is no reason why we should not continue to use, amongst ourselves, the homely word "mealie" it would be most unwise to attempt to place our produce in the markets of the world under such a little known name.

* * * *

Five years ago, namely, in Journal No. 3, April, 1903, we wrote on this matter as follows:—

"In agricultural literature at the present moment there is much confusion in regard to the term 'Corn.' When American and Canadian farmers speak of corn they mean maize or mealies; but when an English farmer mentions corn, he is thinking of wheat. And while the Australian 'from the Gulf down' talks of maize the South African seems frankly satisfied with his own word 'mealies.'

"It is but natural that we should look forward to the day when we shall be exporters of this important cereal, and it would surely be more profitable to place our produce on the markets of the world under the well-recognised name of 'maize' rather than under the purely local and little used synonym 'mealie.' All confusion would soon disappear if this course were adopted. For while the German word is 'mais'; the French term is essentially the same, viz., 'maïs.' Again, in several of the smaller British Colonies the term 'maize' is exclusively used."

* * * *

Most important was the resolution to establish a uniform system of grading for the whole of South Africa, and to adopt the same official brand. It was agreed to select six grades for South African maize, namely:—White, A1 and A2; Yellow, A1 and A2; and Mixed, A1 and A2. All samples which fall below these standards are to be distinctly marked "Below Grade." The following abbreviations may be adopted: W1, W2; Y1, Y2; and M1, M2, according as the maize is white, yellow, or mixed. Maize below grade will be stencilled, in bold type, "Below Grade" in a square with a diagonal bar across beneath a Crown—the interpretation being that the Government has handled the maize and declared it to be of inferior quality. Moreover, South African Grade No. 1 will be considered as choice, and the Grade No. 2 will be equivalent to what is considered in other places as F.A.Q.

A Uniform South African Standard.

(Fair Average Quality). Samples, distinctly labelled Standard No. 1 and Standard No. 2, will be exhibited at all railway stations for the information of farmers and also forwarded to the various corn exchanges of Europe.

* * * *

American Wheat Inspection.

HAVING touched upon our own system of proposed State supervision of maize, it may be of interest to speak of the wheat inspection in Minneapolis—the greatest wheat market in America. The State Inspection Bureau was established in the year 1885 for the purpose of preventing the adulteration of grain, and so raise the standard of Minnesota wheat. The full force of State grain inspectors comprises 33, and of these 15 are located in the City of Minneapolis. The main object of this inspection is to determine the grade of grain and to "dock" it when necessary. The grain is shipped from all parts of the United States to this centre. On arrival at the station a corps of men called *Samplers* enter each of the various cars, and, with a long copper plunger, take out typical samples of wheat. These samples are poured into little 3 lb. grain bags on which is inscribed "*Minnesota State Inspection.*"

A Self-Sustaining System.

THIS Government Inspection is really a self-sustaining system. Each car of wheat is charged at the rate of 15 cents (7½d.). A car can easily hold one thousand bushels. Let us take 200,000 cars at 15 cents per car, viz., $30,000. The cost of flax inspection is much higher, namely, 65 cents per car, because it takes longer to inspect flax which should be probed with the plunger seven times in each car; whereas wheat is only probed thrice. Directly, the cost of inspection falls upon the shipper; but, indirectly, upon the farmer, since the agent at the elevator must necessarily give less per bushel for the wheat in order to pay for the inspection. But the rate is very low so far as the individual farmer is concerned. Briefly, the aim of the Bureau is just to cover the working costs; thus with more wheat the charge of inspection tends to become lower.

Method of Grading.

DURING a single season over 100,000,000 bushels of wheat are inspected by this Bureau, not to mention large lots of other grains. The work of grading begins at 6 a.m., and is all over by 10 a.m. From the cars, on the railroad siding, samples are sent to the Bureau of Inspection in the Chamber of Commerce. Here, there are few more interesting sights than to watch the experts as they weigh, dock, classify, and ticket the different samples. It is done with lightning speed—smut-balls, mouldy grains, wild oats, mustard seeds, mixed varieties, cracked and frosted kernels are all scored down ruthlessly. And the whish of the wheat as it is swept off table after table is broken only by the constant call of No. 1 Hard, No. 2 Northern, or, perchance, Rejected. The whole process is a striking illustration of the intense industry

Sampling Maize.

Plate 58. **A Maize Store.**

The new Export Trade of South Africa.

(Photographs kindly lent by the Natal Government.)

Fig. 1.

Plate 59. Fig. 2.

Views on the farm of Athole, Amsterdam.

Fig. 1. Showing field of Paspalum Grass.

Fig. 2. Field of Mealies and Japanese Millet (*panicum crus-galli maximum*) grown for ensilage.

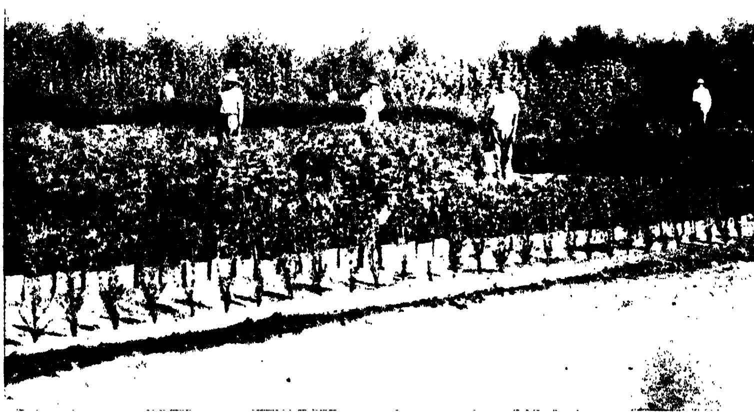


Plate 60.

The Government Forest Nursery at Ermelo.

Plate 61.

"Hard Cash." A Tasmanian Merino.

Bred by W. H. Gibson, Esq., Fairfield, Tasmania.

(Owned by Messrs. A. and V. Robertson, Macquabie and Rolfontein.)

necessary in building up a successful export trade. It is hardly needful to add that these inspectors do not know whose grain they are scoring. The samples received are kept by them for a period of 30 days in case any shipper may wish to protest against the grading. But there is not one complaint in every 20,000 samples tested, which is a sure proof of the faith of the American farmer in State Inspection.

* * * *

The South African Organisation Union.

MANY references have lately been made in the Press to the efforts of Sir Pieter Bam in establishing a Union to follow up the work begun by the South African Products Exhibition in London last year. The subjects for which the Union has been formed are stated to be:—

1. To maintain and strengthen the interest in South African products aroused by the Exhibitions held recently in London and Amsterdam.
2. To develop trade in South African products between the South African Colonies and the markets of the world.
3. To establish, if practicable, in London one General Commercial Agency for the five Colonies, on the lines adopted by Canada and Australia.
4. To stimulate the production of those crops and manufactures for which there is a local or export demand.
5. To further trade interests between England and her Colonies, and especially to push the sale of South African products in every possible way throughout the world.
6. To assist producers and manufacturers by the establishment of a Statistical and Advisory Bureau, with branches all over South Africa; also in London and any other places that may be considered necessary, where advice and information can be obtained with regard to the probable markets for South African products and manufactures; together with the inducements offered for the investment of capital in agricultural, pastoral, and industrial enterprises.

* * * *

In this programme of work a wide field of effort is visible, and we are sure our readers will cordially support the Union. A central organisation cannot fail to be useful in promptly supplying the producer with the information he wants. Furthermore, the proposed bureau—in each office of the Union—of the products and manufactures of South Africa, is a scheme that has met with much success in America. In several towns of California you will find commodious halls housing a comprehensive and attractive exhibit of the finest products of the land, with all the necessary information as to the districts most suitable for their production. And these are permanent establishments. Similar exhibitions have been instituted in many of the larger cities of the Eastern United States, so that the emigrant as he travels westward can see what each State can produce, and where he must go in order to win the best results from the work he wishes to engage in. A permanent exhibition

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of this nature in the heart of the Empire, as well as in Pretoria, would undoubtedly be the means of attracting that capital so urgently needed for the development of our latent industries.

The potentialities of the Transvaal are immeasurable. It is in the development of these enormous possibilities that the economic salvation of South Africa will surely be found. In addition to the work to be done in South Africa it is suggested that the London office shall assist South Africans who may wish to visit the various Experimental Farms, Agricultural Colleges, Stock Farms, and other places of interest and educative influence. Two offices have been opened in the Transvaal: the one at No. 15, Reserve Investment Buildings, Pretoria, and the other at the National Bank Buildings, Johannesburg, where the local secretaries—Messrs. H. E. King (Box 335) and H. J. Lamb (Box 1244)—will be glad to supply any further information.

* * * *

The General Manager, Government Stud Sheep Farm, Ermelo.

In this issue we publish a valuable paper on the subject of Wool Classing, from the pen of Mr. Vincent Bossley, General Manager of the Government Stud Sheep Farm at Ermelo. Mr. Bossley, who is an Australian of English and Irish descent, was born in the city of Sydney. He was educated by private tutors on his father's sheep station, and later attended the schools of Sydney, Melbourne, and Wollongong. As his father is a firm believer in the maxim of *going through the mill* Mr. Bossley at an early age was put to work in the big shearing sheds as sweeper and tar-boy, and so on through the whole routine until he finally had charge of the sheds where over 2,000 shorn sheep are turned out in a day. While still a lad Mr. Bossley was put on the road droving—taking flocks of sheep long distances to market and to the *relief country* in times of drought. In the same thorough manner he studied the theory and practice of station work, and for several years managed a property carrying 25,000 sheep. Most of Mr. Bossley's experience has been gained amongst Tasmanians; but he has also bred Lincolns, Leicesters and Australian Merinos. Altogether some 70,000 sheep and many thousand rams have passed through his hands. Already, Mr. Bossley's efforts on behalf of the sheep industry are being felt in the Eastern Transvaal, and we are sure our farmers will give him their heartiest sympathy and practical support.

* * * *

Disposal of Wool in Australia.

Mr. Bossley has sent us a timely note on the disposal of wool in Australia. At all the principal seaports in Australia, viz., Sydney, Melbourne, Adelaide, and Brisbane, the big wool firms receive their wool direct from the grower. The flock-master notifies these firms respecting the disposal of the wool: whether the wool is to be sold on the Australian market or shipped to London; or whether it is to be sold in the grease or scoured; or perhaps offered under a reserve in Australia, and the price not being reached, forwarded on to the Home market. The

wool is insured by these firms from the sheep's back; that is to say, from the day it is shorn till the fleece is sold. The wool is then taken to the warehouse, valued by the market expert, and a sum of money equivalent to three-quarters or four-fifths of the estimated value of the consignment is at once paid into the owner's credit account. Naturally, fluctuations in the market are carefully noted. Next the wool is catalogued for sale or shipment in accordance with the expressed wish of the wool-grower. But if the firm's experts see any fault or consider anything should be done to improve the sale of the wool the owner is at once informed. After the wool is finally sold a short statement of the faults—in classing, packing or quality—is forwarded to the owner, who thus knows how to remedy the particular errors in the get-up of his wool year by year.

* * * *

If some similar system could be organised in the Transvaal much benefit to the wool trade would surely follow. Possibly the time is not yet ripe for a private company to succeed—the wool clips of this country being so small and varied. It has taken the Australian firms many years of careful management and the expenditure of much capital to gain the goodwill of the people. But the formation of a Government wool bureau at the principal centres of the Transvaal might solve the problem. In any case the present system of selling wool to storekeepers, small dealers and others who care nothing for the future of the industry so long as they make an immediate profit, can only retard the growth of the wool trade. It is really of little use to induce our sheep farmers to classify and prepare their wool in an up-to-date manner if we then leave them to the tender mercies of the storekeeper, who gives no more for classed wool than for unclassed. There are many farmers who would like to send their wool to the London market, but as no facilities are placed in their way they simply go no further than the nearest store. A great work has been done in this Colony to foster the export trade in maize; and we are certain the Government will, in like manner, come to the aid of the wool industry.

* * * *

A Wool Report.

Messrs. Buxton, Ronald & Co., of London, have issued an interesting report on the wool that passed through their hands from October, 1906, to October, 1907 :—"The Orange River Colony showed some particularly nice parcels, the top price being as high as 11½d. These wools, though varying in condition according to the different districts, all showed signs, in a weak staple, of a trying and droughty season. This Colony has evidently taken up the question of classifying and skirting very earnestly." "*Packed and sorted under supervision of the Government Inspector*" has become a well known phrase, and the operations being carried out in the most approved fashion, cannot fail to bring their own reward to growers. In an open free market it surely stands to reason that well prepared lots must meet with the most support and ultimately return to the grower such prices as will more than make up for any expense to which he has been put. Reasonable care must always be employed to get the

best result, and when, as is so often the case, short and long wools, strong and weak, skirts and bellies, are all baled up together, it is, as a rule, safe to say more care might reasonably have been taken. Growers should always remember that the manufacturer is able to pay the longest prices, and he is therefore the one whose wants should receive most consideration. It is self-evident that if the man who wants long wool only has to buy short staples along with it, his price will at once be much reduced.

Moreover, in any efforts which are made to get up wools suitably for this market it would be well to bear in mind the advisability of branding the bales with the owner's name or preferably with that of his property. This is retained in a buyer's mind from year to year more readily than mere initials ever can be. A fair quantity of East Griqualand wool came on the market early in the year and showed the usual characteristics of the district, being very soft handling. They were marketed in good style, and, being properly classed, met with considerably more attention than they otherwise would have done, seeing that owing to an unfavourable season the condition was none too good and the staple lacking length. 11½d. was the top figure reached.

With regard to the actual breeding of the sheep, this is a matter which the grower himself must know most about; but it should be remembered that a big weight of clean wool is the object to aim at. A heavy fleece with a large percentage of grease and dirt is fully reckoned up by the buyer and less paid for it accordingly. The effects of the recent importations of Australian stud sheep will be eagerly watched. For excellent as much of the wool shown at the South African Products Exhibition was there was also a goodly proportion of it which would have been better for a more robust strain.

Forestry in America and Australia.

An instructive bulletin on the "Progress of Forestry in 1906," by Quincy R. Craft, has just been issued by the Department of Agriculture, Washington, U.S.A. For more than four years the railways of America have been co-operating with the National Government in investigating the possibilities of planting trees for sleepers, and the best methods of prolonging their life. Mr. Craft mentions that the Santa Fe Railway has recently purchased 8,330 acres near San Diego, California, on which to grow timber for its own use, of which a tract of 2,600 acres will be planted to Eucalypts. This shows the growing interest in this class of timber. Moreover, we learn that much interest in forest methods is being manifested by companies engaged in Redwood (*Sequoa sempervirens*) lumbering in this State. A tract of 15,000 acres has been acquired which will provide for planting eucalypts on cut-over redwood lands. The eucalypts produce one or more crops while the redwoods are still maturing, besides which in competition for growing space they assist the redwood to form long branchless trunks. Where the tempering influence of the coast fogs is felt, conditions are ideal for the growing of eucalypts suitable for timber, and, because of the lack of other hardwood timber, a good market is promised. Furthermore, tests

of eucalypts show that they can be used as substitutes for hickory and oak for many purposes. Turning to the Southern Hemisphere, those of our farmers who possess plantations of the "*Monterey Pine*" (*Pinus insignis*) will learn with interest that in the last annual report on the State Forests of South Australia the Conservator of Forests, Mr. Walter Gill, F.L.S., states that a trial lot of butter cases made from this wood has proved most satisfactory. This possibility was indicated many years ago by the famous botanist, Baron von Mueller.

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Trees at Vereeniging.

THOSE of our readers who are interested in the growth of young trees should endeavour to visit the Public Park at Vereeniging, which was planted for the purpose of a pleasuring ground and at the same time to test the frost and drought resisting qualities of trees. Mr. T. N. Leslie, F.R.Met.Soc., to whose skill and enterprise these valuable experiments are due, has compiled a comprehensive report upon the comparative merits of the different species planted.

The site was ploughed and cross-ploughed two years before being planted, partly for the reason that roads had crossed it before it was fenced off and the traffic had consolidated the soil; and, partly, so that the ground might be in as thorough a state of cultivation as possible. The advantages of this preliminary cultivation are now apparent: one-year-old gums having made an average growth of eight feet.

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The height of the park above sea level is 4,730 feet; the situation is extremely exposed, being quite flat; and the soil is a brown, shallow loam, with yellow ironstone gravel as a subsoil, with the exception of some parts of the streets where it is a rank clay. The average rainfall from 1892 to 1901 was 26 inches; from 1902 to 1906, 22.41 inches; the effect of these years of low rainfall told severely on such trees as *Pinus pinaster*; whilst *Cupressus macrocarpa* nearly all perished. The rainfall for last year was 30.5 inches or 5 inches in excess of the average.

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Meteorological Instruments for Farmers.

IN accordance with a decision of the Hon. the Minister for Lands, the Meteorological Department has been authorised to supply meteorological instruments to farmers and others at cost price, plus duty and a small charge for handling. Such instruments will only be supplied subject to the exigencies of the Department. Self-registering minimum and maximum thermometers which should be exposed in a properly ventilated screen will cost 16s. 6d. each. The screen can be made locally—in Johannesburg one costs 57s. 6d. On request the Director of the Meteorological Department will supply sketches by means of which any carpenter can build up a screen.

A hygrometer for determining the humidity of the air consists of two thermometers with a water cistern—the complete set costs 17s. This must also be placed in a screen.

Self-registering grass minimum thermometers for showing the lowest temperature on the ground at night will cost 17s. each.

The Director of the Meteorological Department states that a barometer is not of much use as a weather guide to a farmer in the Transvaal. The changes of pressure are too small and the instrument must be carefully watched. If, in spite of this, a barometer is wanted, it can be supplied at from £6 to £8·11s. 0d. These prices are for delivery in the Government Observatory—the risk and cost of carriage will be the purchaser's. Any instruments supplied will have been verified and a table of the corrections required will be supplied with each. The Meteorological Department will supply daily registers *gratis* provided that the observer undertakes to send, in return, a copy of his observations.

Protection from Lightning.

MR. R. T. A. INNES's article on "Protection from Lightning," which appeared in "Journal" No. 21 (October, 1907) has evoked a volume of correspondence from various parts of the country. On page 8 of that number Mr. Innes wrote:—"But let us suppose the worst happens and that someone is struck and rendered insensible by lightning. The first thing to remember is that the person is not dead, but unconscious. If the body is badly burned (a very rare occurrence, be it noted) perhaps resuscitation of life will not be successful. Anyhow, strip the body at once and apply the movements used for drowned persons so as to get the heart and lungs to resume their functions. One of the weekly electrical journals publishes a sheet giving the full directions to be followed in case of apparent death due to the passage of a heavy electrical current through the body. When it is considered how very cheap these sheets are, it becomes a question if one should not be hung on the walls of every schoolroom in the Transvaal and explained once a year to the school children. In building shelters for live stock, if these are roofed with sheet iron supported and connected with iron posts, they are certainly durable, and cattle under them cannot be injured by lightning."

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Apparent Death from Electric Shock.

AND at the earnest request of one of our readers we insert the paragraph on resuscitation, taken from the "Electrical Review," referred to by Mr. Innes: "In many cases where persons receive electric shocks, death is only apparent, and animation may be restored if efforts at resuscitation are not too long delayed. The method of resuscitation resorted to should be that known as artificial respiration. Steady persistent effort is one of the essential conditions of successful attempts to restore animation. Disappointing though the results may be, it is better to prolong the operation rather than discontinue it at too early a stage, unless a medical man pronounces life to be extinct. In case of severe shock, respiration is seldom established under one hour, while *three hours* may be necessary to restore normal breathing.

"Break the circuit at once if there be an interrupter close at hand; if not, lose no time, but proceed to remove the body from contact with the circuit. Do not touch the man's body with bare hands, but if India-rubber gloves are not at hand pull him off the cable by his coat tail if his clothes are not wet, or fold your coat or some dry article, such as a newspaper, into two or three thicknesses, and, using this as a pad, take hold of the body and pull it away from the circuit; or a broom handle may be used to raise the body or to detach the wires from it. A good plan is to stand on a dry board, or on a thick newspaper or bundle of sacking, or charge the body with the shoulder. No time should be lost in sending for a qualified medical man, but, in the meantime, the following efforts should be made to restore animation:—

"Having pulled the body away from the cable, free the neck from clothing and treat the case as one of drowning, as follows: The body should be at once placed upon the back and the clothes loosened. A roll made of a coat or anything else convenient should then be placed under the shoulders. It should be sufficiently large to prop up the spine so that the head drops backwards. Open the mouth, and taking hold of the front part of the tongue with the fingers (covered with a towel or handkerchief, if one be available), draw the tongue forwards, and gradually let it go back. Do this about fifteen times a minute; be sure the root of the tongue is acted upon and drawn forward. If the teeth are clenched, and you cannot get them apart with your fingers, gently separate them with the handle of a pocket knife or by means of a small piece of wood.

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"At the same time that these rhythmical tractions are made upon the tongue, another operator should kneel behind the head. He should grasp the forearms just below the elbow, and draw the arms upwards and outwards towards himself with a sweeping movement making the elbows almost touch the ground on either side of the patient's head, and holding them there for two or three seconds. The arms may then be returned to their position alongside the chest and strong pressure made against the ribs. After two or three seconds the arms should be again carried above the head, and both up and down movements should be repeated at the rate of ten or fifteen times per minute, the arms being extended above the head when the tongue is drawn forward by the other operator, and the arms brought down when the tongue is allowed to recede. Circulation may be aided by rubbing the body or striking it with a wet towel. Stimulants should not be administered unless recommended by a medical man.

"It should be borne in mind that to be successful the foregoing operations should be carried out deliberately and methodically. There should be no haste, but the operations should be executed vigorously."

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The American Weather Bureau.

THE American Weather Bureau has recently issued its report for 1905-6, from which we observe that weather forecasts for 36 and 48 hours in advance are made daily throughout the year for each State and Territory, besides special warnings. The material necessary in the forecasting service is gathered from 160 daily telegrams each morning with a lesser number in the evening. A novelty in forecasting is that forecasts are sent by wireless telegraphy to steamers in the Atlantic

and Pacific Oceans. Daily forecasts are sent to 76,719 addresses by mail, to 1,014,285 by telephone, and to 4,659 by railroad services.

The staff of the Weather Bureau consists of 513 persons; besides these there are 900 who receive nominal salaries for the display of storm-signals, etc. The number of climatological stations in the United States is about 4,500. The Bureau issues upwards of 8,000,000 weather maps each year. All this cannot be done for nothing. As a matter of fact the Weather Bureau spends about £250,000 a year, but the voluntary testimony of farmers and Chambers of Commerce shows that the direct saving effected by means of warnings of impending storms, floods, frosts, and cold waves is far in excess of this sum.

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Obstacles to Sheep Farming.

Mr. J. C. Rous sends us a timely note on the obstacles to sheep farming in the Transvaal from the farmer's point of view. Speaking of wireworm* he says that few people realise the enormous losses caused annually by this pest, and yet wireworm is responsible for the death of at least half the sheep and goats in the Transvaal. Mr. Rous says: "Last year was a particularly bad one for this pest, and I know one farmer who lost 380 head out of a flock of 400 by it." Regarding scab, Mr. Rous maintains that it is not the owners of large flocks who are chiefly responsible for the retention of scab in the country, but rather the owners of small lots, varying in number from 2 or 3 sheep up to 50. These "klompjes" of sheep and goats are nearly always scabby. They are the real centres of infection, and, until scab is eradicated from the small flocks we will never be free from this disease. Mr. Rous advocates the erection of public dipping tanks by the Government in the various wards. The remaining three common diseases such as blue tongue, heartwater, and geil sickness will not constitute permanent obstacles to successful sheep farming provided the two chief diseases—wireworm and scab—are effectively dealt with.

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The Netherlands Stud Book for Cattle.

As the question of importing Friesland cattle is frequently discussed in the Transvaal every stock farmer should know something of the Dutch Studbook; and we are indebted to Mr. Robert Pape, Superintendent of Dairying, for the following information:—

The Studbook comprises three heads:

1. The Friesch or Hollandsch Herd.
2. The Zwartblaard or Zwartwitkop Groningsch Herd.
3. The Roodbout Maas-Rijn en Ysel Herd.

To prevent confusion between these herds, certain fixed colours have been given to the papers relating to each herd. Once those colours are known, mistakes are practically impossible. These colours are:—

For the Friesch Hollandsch Herd, *White*.
For the Groningsch Herd, *Blue*.
For the Maas-Rijn Ysel Herd, *Red*.

* The Veterinary Division has issued a circular on the treatment of Wireworm which can be had on application to the Government Printer: instructions on the treatment of this disease are also embodied in the article written by Dr. Theiler and Mr. C. E. Gray on Veterinary Hygiene. (See Agricultural Journals, Nos. 15, 16, 17, 18 and 21).—Editor "T.A.J."

The official certificates of registration required for exportation are in the same colours. For inland use a different certificate is supplied, but this is not officially recognised for exportation. Special notice should be taken of the *marking letters on the horns.*

The studbook for each herd is sub-divided into three as follows:—(1) Register; (2) Studbook; (3) Selected studbook. All cows which are inscribed in the register belong to a certain herd and have passed the inspector. But as a rule nothing is known about their descent. Such cattle bear on the horns the letter R. Cattle of which the pedigree is known are registered in the studbook and have on the horns the letter S.

Animals coming up to a high standard and with a good pedigree can be inscribed in the "selection studbook" and are marked on the horns with the letters S K. Therefore, when the importation of horned cattle from Holland is contemplated, the farmer should carefully consider what sort of animal he wishes to buy. For ordinary dairy cattle S and even R will be quite sufficient. But if animals are required for improving Transvaal stock or for crossing, then S K should be insisted upon.

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The Government Abattoir, Pietermaritzburg.

In view of the interest now being taken in the question of Abattoirs for the various Municipalities of the Transvaal, the following note kindly supplied by Mr. A. Burford, Manager of the Natal Government Cold Stores, will be of interest:—

The Abattoirs in Natal have been erected by the Minister of Agriculture to deal with slaughter cattle from infected areas and so put into practice the stamping out policy. The compulsory Slaughter Act now being in force, the Government have commenced taking over cattle in infected areas, and about 100 head are received and dealt with daily. With regard to the purchase of the animals, the Government are now taking over cattle under the Compulsory Slaughter Act and are paying prices according to an approved schedule. The cattle are brought direct into the Government Abattoir Siding and off-loaded on a platform with two entrances leading down into the kraals. This siding is enclosed by a barbed-wire fence with gates at either end. Local butchers are using the Abattoir at a monthly rental per killing space, and by obtaining permits from the Veterinary Department, can send their cattle here to be slaughtered from infected areas; farmers also can send their cattle to the abattoirs where the animals are sold by a local auctioneer at the highest market rates.

The meat is sold in bulk to a contractor. No cattle in any way affected with disease are allowed into the Abattoir. Special care is taken by the veterinary officer who is appointed to take over all cattle and to examine them again before being trucked. All hides are dealt with at the abattoirs, and a firm of hide merchants have sheds and every convenience for dealing with hides, horns, and hoofs. Nothing with the hair on is allowed to leave the Abattoir unless it has been thoroughly disinfected with a strong solution of sheep dip.

The machine used for refrigerating purposes is a 45-ton "Hercules" machine; while the ice-making plant is capable of producing 8 tons daily. The Abattoir consists of seven rooms with cubic capacity of 55,065 feet.

Here are a few details of construction:—Killing space, 60 ft. x 40 ft., with 9 rings and 9 sets of hoisting tackle fitted with wire rope; 2 winches and overhead rails on which the meat in sides is run into the hanging room, 60 ft. x 40 ft. Nearby, it is quartered and bagged in hessian cloth ready for immediate trucking or to be taken into the chilling or freezing room. Outside the killing floor are two kraals with iron rails and large gates 7 ft. high. The cattle are roped in from the kraals and pithed; 150 can be dealt with in a day. The yards consist of 11 large kraals, so that different consignments of cattle can be kept separate. The whole place is enclosed in a corrugated iron fence 6 ft. 6 in. high, topped with 2 ft. of barbed wire having an inward angle. Further, outside the killing floor there are two cement pits, and the blood and waste offal is drained from the floor into these pits, and from thence transferred into iron tanks and taken to the Government Experimental Farm at Cedara to be used for manuring the land.

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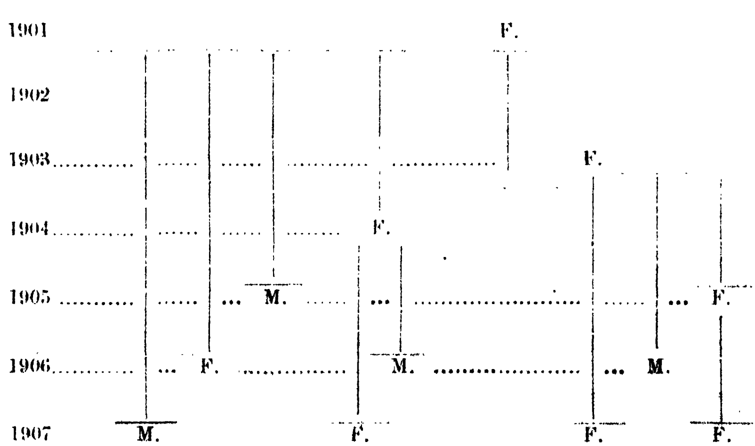
Preservation of Female Game.

MAJOR J. STEVENSON HAMILTON, Warden of the Government Game Reserves, sends us a note emphasising the importance of sparing the females of our wild game, and shows in a graphic way the effect of the wanton destruction of the mothers of certain species. To demonstrate the immense practical importance which the preservation of females would have upon the increase of game, the following table has been drawn up representing the natural progeny of one impala ewe for a period of six years. The ratio of females born over males has been set at seven to four. It will be seen therefore that at the end of 1907, providing that the first two lambs happened to be females, and that no accidents occurred, the progeny would amount to eleven; impala ewes breeding every year, and the young females producing young in their second year.



But now let us suppose for the sake of argument that the original mother of the family is killed in the shooting season of 1904. That is to say, she has reared her first lamb, a female in this case. It

is obvious that the whole of the right hand portion of the table must be swept away, and at the end of 1907 we shall have left only the first lamb and its progeny; a total of five animals instead of twelve. It is equally plain that had the first offspring happened to be a ram instead of a ewe, and had the mother been subsequently shot at the end of 1907 we should have only one animal to show as our total. And all this would have been the result of the killing of a single female. When, therefore, we reflect upon the enormous number of females killed annually, it is easy to see why game does not increase in the Transvaal.

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The impala has been taken as a typical example, but the above might equally well be applied to other sorts of game, except that in the case of some species there is not the same marked preponderance of females over males. It seems a provision of Nature that felines usually find it easier to stalk and to kill the males of most species; partly, because the females in a herd are usually more alert and nervous than the other sex, and, partly, because the many solitary males of the larger sorts of game are comparatively easy to approach. Thus it is ensured that there shall not be an undue destruction of the mothers of any race under the ordinary conditions; but man steps in and at once upsets this nicely adjusted balance, with the most far-reaching and disastrous results. Accordingly, it should be our aim to make our sport so harmonize with Nature's methods that we may secure our rightful pursuit of pleasure without wantonly violating her laws or permanently injuring her handiwork.

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The Soil Mulch and Irrigation Practice.

In this "Journal" the value of the soil mulch and proper irrigation practice has been repeatedly urged. The other day a series of experiments were undertaken in America to determine the effect of the soil mulch in preventing the evaporation of water from lands that had just been irrigated. It was assumed that 100 per cent. of moisture would be evaported or lost from a bare surface, and with this figure as unity the following results were obtained:—

With a 4 inch soil mulch 30% of moisture was lost.
,, 8 ,, ,, ,, 14% ,, ,,
,, 10 ,, ,, ,, 2% ,, ,,

This table shows in a striking manner that a soil mulch of a depth of ten inches affords practically complete protection from evaporation. The same experiments also demonstrated that the loss of moisture was very great for a short period just after the irrigation had ceased. This means that the sooner the farmer can form his *soil mulch* the better. In fact, the lands should be cultivated or harrowed as soon as the implements can be worked without clogging the machine or harming the soil. Furthermore these tests emphasised the benefit of heavy irrigations—using deep furrows—rather than frequent light irrigations with shallow ditches. For these tests we are indebted to Mr. A. M. A. Struben, A.M.I.C.E.

Transvaal Peaches for Canning.

MR. L. DICEY, Director of Western Province Preserving Company, Ltd., notifies us that his firm has appointed an agent to go round certain districts of the Transvaal in order to secure large quantities of the common yellow clingstone peaches. Those fruits, though well suited for canning purposes, are practically valueless on the ordinary market. The stations tapping the districts in which the firm's agent is working are those lying between Warmbaths, Fourteen Streams, Krugersdorp and Zeerust, and Mr. T. R. Price, General Manager of the Central South African Railways, has promised to render all possible aid in speedy transit by rail to the factory. Although, for the moment at least, this business is more or less in the nature of an experiment, it is confidently believed that three hundred tons of fruit will be shipped from the Transvaal during the present season.

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The Transvaal Beekeepers' Association.

IN the name of our readers we cordially welcome the Beekeepers' Association which has been recently formed, and we are sure all apiarists in the Colony will find it to their advantage to at once enrol themselves as members of this Association. The Hon. Secretary and Treasurer, Mr. W. H. Blower, P.O. Box 2903, Johannesburg, will be glad to furnish any further information regarding the aims of the Association.

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The Committee of the above Association has arranged that members who have any honey may send it for exhibition and sale to the Y.M.C.A. Industrial Exhibition, to be held in Johannesburg from the 11th to 25th April next. The bottles, sections or frames must bear the registered number 56. Exhibits should be consigned, carriage paid, to the Secretary, Transvaal Beekeepers' Association, Raine's Buildings, Johannesburg, and must be despatched in time to arrive about the 8th of April

To illustrate the rapid progress which the bee industry is making we have only to recall the handsome prizes offered for honey by the Transvaal Horticultural Society at their first spring show held in Johannesburg last November. The weight and quality then staged reflected great credit on the competitors. The display (over 300 lbs.) was unquestionably a record, and clearly proved that there are districts in the Transvaal capable of producing honey in large quantities and of the highest quality.

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Artificial Swarming.

THOSE of our readers who know something of artificial swarming will value a note on "How to make Two Colonies from One," by Mr. Frederick Sworder. Bees increase in large numbers when there is a good honey flow. The result of this is that they make preparations to swarm, as their abode is getting uncomfortably full. During this period they are in an unsettled state, and provided the weather is favourable, their owner may lose his swarm. If we desire an increase of stocks an artificial swarm can

be easily and successfully made in the following manner: On a fine afternoon, after having taken the necessary precautions to subdue the bees, open a strong hive, lift out, and examine three frames from the centre and search for the queen.

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When found, place these frames of comb along with her and the hatching and adhering bees into another hive previously prepared: next cover the frames with clothing. Move the remaining frames of the brood in the old hive to its centre, filling up the empty space with frames of foundation and preferably wired. Now move the old hive, which is queenless, say, 40 feet away, and on the spot where the old hive stood place the new hive, carefully covering these frames with warm quilting, and the operation is finished. By this simple method it will be seen that only one stock of bees is disturbed, and the old bees from the old hive will return to the old spot. Further, this hive has plenty of female eggs besides hatching bees, and is in excellent condition for raising a queen. She will be laying in a fortnight. Most of the old bees will fly back to the old spot and form the swarm. Frames of brood foundation must be added, as required, to the new hive which now possesses the old laying queen.

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The Transvaal Biological Society.

AT a meeting of scientists held in the Government Museum on Monday, January 13th, it was resolved to form an Association, to be called "The Transvaal Biological Society." The object of this Society is threefold: To promote the discussion of scientific problems by biological investigators; to arrange for regular meetings for this purpose; and to publish the proceedings of the meetings. Any person is eligible for membership who is actually engaged in biological investigations, and has published at least one scientific paper, or is working on such. At least six meetings are to be held each year; special meetings to be called by the committee, if necessary. The committee for the current year consists of Dr. Theiler, C.M.G., President; Mr. Joseph Burtt-Davy, F.L.S., Vice-President; and Dr. L. H. Gough, hon. secretary and treasurer. The new Society will fill a long-felt want, and doubtless prove of material assistance to the agriculturists of this Colony.

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Entrance Requirements at two Agricultural Colleges.

MANY of our farmers who are interested in the problem of a proper and practical agricultural education for their sons will like to know the entrance requirements at two well-known colleges, the Michigan Agricultural College, U.S.A., and the Ontario Agricultural College, Guelph, Canada. At Michigan, the entrance requirements presuppose that the applicant has the ability to harness and drive horses, to plough, harrow, mark corn ground, drill, operate the mower, reaper, and farm implements generally, and to perform in a neat and workmanlike manner the details of regular farm work. A failure to pass this examination will not exclude from the college; another opportunity will be provided at the close of the second year to pass on these studies. If the student then fails he will be required to remain at the college during the summer

vacation between his second and third years, or to work for the same period on some part of the farm approved of by the Professor of Agriculture. He will then receive his final examination in this subject at the beginning of the junior (third) year. At Guelph the student must produce certificates of having spent at least one year at work on a farm, and must have a practical knowledge of the ordinary farm operations, such as harnessing and driving horses, ploughing, harrowing, drilling, etc. When it is thought necessary this knowledge will be tested by an examination at entrance, or at any subsequent date.

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Water Boring: Irrigation Department.

THE work being carried on by the boring branch of the Irrigation Department is growing apace, and the demand for bore-holes to obtain water supplies is increasing from many sources. The result of boring on the agricultural lands has been that 2,711 feet have been drilled, at an average cost of 8s. 10d. per foot. Twenty-five bore-holes have been completed, and a gross supply of 766,900 gallons of water per day, at a substantial reduction in the cost. For settlers 1,020 feet were drilled, at a total cost of £503, or 9s. 10d. per foot for eight bore-holes, and the estimated daily supply of water obtained was 48,700 gallons.

The boring already conducted over practically the whole of the Transvaal has proved that on the average water can be tapped and utilised at a cost within the means of almost any stock farmer or agriculturist. The comparatively large expenditure by Government on drilling plant and boring operations has been justified by the results obtained, as well as by the information gained regarding the geology of the Colony, water-bearing properties of rocks, cost of boring, and most suitable machinery.

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Irrigation Office at Standerton.

FARMERS will be glad to hear that the Irrigation Department has stationed an Executive Engineer at Standerton. Mr. C. D. H. Braine, A.M.I.C.E., has been appointed to this post. His district comprises Heidelberg, Bethal, Carolina and the rest of the south-eastern portion of the Transvaal; and his duties will be to advise farmers in the construction of irrigation works, dams, furrows, etc. Mr. Braine is already well known to the farming community by reason of his zealous and excellent service as Secretary to the Irrigation Commission, and he has contributed several valuable papers on irrigation matters to the pages of this "Journal."

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Athole.

NOT long ago we had the pleasure of visiting the farm of Athole, which is situated 5 miles from Amsterdam, and lies 14 miles from the Swaziland border. The late Mr. David Forbes, the well-known Scotch pioneer, trekked into this part of the world in the year 1866, together with a small band of sturdy Scotch settlers; and his sons are now the owners of a fine property, which comprises some 50,000 English acres. The land is well suited to grazing, and the veld consists mainly of ordinary rooi and tambookie grass. There is both High and Low Veld, where at the present time you will find a fine herd of over a thousand cattle. These animals

are many coloured; and by their curious markings show the commingling strains of the original Swazi cattle, Africanders, Devons and Frieslanders. Athole is specially adapted for ranching purposes; 25,000 acres have now been enclosed, and the cattle are seldom in a kraal; the calves being allowed to run with the cows. Most of the cattle are therefore *troop cattle*, which run on the veld day and night with their calves. A few milch cows are milked in the morning in the home kraal, and their calves are allowed to run with them all day. This practice has been found to prevent scouring in the calves, as, where the youngsters are able to get a little milk now and then, they seem to suffer less from indigestion.

It is customary at Athole to cut large quantities of veld hay. All the thin cattle are drafted into one troop and fed with hay every night, hay-racks being placed along the walls. The mealie lands have also been fenced off, and the poorest of the herds are put in these enclosed lands to feed off the mealies stalks. Last winter out of 1,200 head of cattle the loss was less than one quarter per cent. The bulls are taken out of the land at the end of winter (August) and put back in the middle of December, so that the calves are dropped from September to January, when the veld is good.

There is a certain amount of tulip on this farm, but in dosing with tulip according to the native plan cattle are seldom or never lost. The tulip is boiled, and each beast is given a drench of it. This is done just before trekking into the tulip area, and has been found to be most effective. Again, there are two spots on this farm where sheep die if allowed to graze any time from the month of December until the coming of the first frost. They die from poisoning, or what is locally termed "Quick sickness" (Dutch: "Gouw ziekte"), but sheep put on the same lands in winter time thrive exceedingly. Goats are similarly affected.

Fodder versus Winter Trekking.

MR. C. van FORREST writes in an emphatic manner against the practice of overstocking, and urges the storing up of winter fodder for both sheep and cattle. He states that every year hundreds of lambs on the High Veld are sacrificed for lack of fodder; and that often cattle are so weak in the early spring for want of proper feeding that they have to be lifted. As long as this state of affairs prevails stock farming in the Transvaal cannot be expected to pay. Another matter which has been so often discussed in the columns of this "Journal" is winter trekking to the Bushveld. There is no doubt that this winter trekking seriously affects the quality of the wool, since it soon becomes full of dust and dirt. Moreover, some of our farmers have conclusively proved that sheep kept on the High Veld and properly fed throughout even the coldest winter come out in spring in a much better condition than those which have had a trek to the Low Veld. The sermon preached by Mr. van Foreest is sound, and the text may be set forth in three heads:—(1) Buy a mowing machine; (2) dig an ensilage pit; and (3) sow mangels. We hope that these words of wisdom will produce an hundred-fold in better wool and more sheep.

Two New Societies.

We cordially welcome two new associations which have just been formed. The Maquassi Farmers Association and Agricultural Society has been started to encourage and develop the farming industry of Maquassi and Wolmaransstad District. Mr. A. E. Grigson, the hon. secretary, has kindly forwarded us a tastefully printed book of rules.

In the past the Pretoria Agricultural and Industrial Society rendered valuable service to the rural industry of the Transvaal, and we are glad to see that it has again taken its rightful place amongst the Agricultural Associations of this Colony. General Botha has been elected honorary president, and the following gentlemen are members of the committee :—President, F. T. Nicholson, Esq.; secretaries, Messrs. Huyton Cornforth and G. F. Joubert ; treasurer, J. Wagner, Esq.

This Society has been in existence for the last 18 years. It was founded by General Joubert, Mr. Jan Celiers, and Mr. R. T. N. James. Formerly, the Society limited its work to the holding of agricultural shows, but now it is proposed to help the farmers in many other directions. At the last meeting it was decided to elect Mr. Rose-Innes, Resident Magistrate of Pretoria, an hon. member of all committees, as well as the experts of the Agricultural Department. We trust that a large number of both townsfolk and farmers in the district of Pretoria will support the Agricultural Society of the Capital in a hearty and sympathetic manner.

* * * *

The Government Sale at Ermelo.

On Friday—the day following the Ermelo Agricultural Show—a successful sale of Government sheep and horses took place at Ermelo. There was a large attendance of farmers from different parts of the country, together with the Right Hon. the Minister of Agriculture, General Louis Botha, the Director of Agriculture, Mr. F. B. Smith, and various Departmental officers. The first animals to be offered for sale were 29 pure-bred merino rams, partly bred on the farm, partly imported. The first ram, an imported animal, fetched as much as £40, and the average price per head amounted to £17 5s. Twenty-six Spanish merino ewes, bred by J. H. King, Highland Home, Cape Colony, and sired by the best rams on the farm, averaged £6 14s. each. One hundred and ninety-six imported Tasmanian ewes, bred by Mr. B. Haydon, New South Wales, were sold at an average price of £3 15s. per head. Next came the horses. Bidding was slow. The mares realised from £15 to £27, and fillies from £10 to £26 ; while geldings went as low as £6. The net total of the sale amounted to £2,096 6s. 6d.

* * * *

Railway Concessions to Judges at Agricultural Shows.

We have been advised, through the courtesy of Mr. T. R. Price, C.M.G., General Manager of the Central South African Railways, that the following concessions have been agreed to for judges proceeding to officiate at Agricultural Shows, viz., over the C.S.A.R., C.G.R., and C.F.L.M., half single fare for the double journey ; over the N.G.R., single fare for the double journey. The concession will be extended to 12 judges in respect of ordinary country shows, but the Administrations will double the number in the case of large shows such as those held at Pretoria, Bloemfontein, and Johannesburg.

A Chance for Chicory Root Growers.

THE Government Botanist writes that a South African firm of coffee and chicory manufacturers has sent a communication to the Department offering to purchase sun-dried chicory root at from £10 to £15 per ton in bulk. They state that a Pretoria firm has at present indents for 15,000 lbs. to be shipped from Europe.

* * * *

A Tasmanian Merino.

PLATE No. 65 shows "Hard Cash," a pedigree merino ram, bought for 150 guineas at the annual Sydney sale for the stud of the Hon. A. G. Robertson, M.L.C., and V. L. Robertson, Esq., Amersfoort. This fine animal was bred by W. H. Gibson, Esq., of Fairfield, Tasmania. The Messrs. Robertson have also lately purchased two pedigree stud ewes, specially selected by Mr. W. J. McCarthy, the well-known importer of pedigree sheep.

* * * *

Farm Cheese.

IT is indeed gratifying to find that several farmers' wives in the Transvaal are now actively engaged in the manufacture of cheese. This is an industry which is greatly needed in this Colony, and we would like to congratulate Mrs. Forbes of Athole on her cheddar cheese, and the Hon. Mrs. Scott of Devon on her cream cheese. We shall be glad to hear of the success of any other ladies in this enterprise.

* * * *

A Correction.

IN "Agricultural Journal" No. 22 (January, 1908), in Dr. Theiler's paper on "The Prevention and Eradication of Stock Diseases," the following error occurs (page 223, lines 10, 11, 12) :— The sentence : "The carrier of the parasite, which, in the case of nagana is the fly, is called the reservoir of the virus" . . . should read : "In case of nagana, the tsetse fly is known as the *carrier* of the parasite, and big game are called the *reservoirs of the virus.*"

AGRICULTURAL NOTICES.

Veterinary Division.

ARRANGEMENTS FOR FORWARDING PATHOLOGICAL SPECIMENS.

It is hereby notified for general information that special arrangements have been made with the Central South African Railways for forwarding pathological specimens for examination in the Veterinary Bacteriological Laboratory, and all such specimens can now be sent carriage forward, if addressed to the Government Veterinary Bacteriologist, Pretoria Station, and distinctly labelled "Scientific Specimens for Examination." The Government Veterinary Bacteriologist is at all times glad to make examinations and to report on pathological specimens, but farmers and others sending such are earnestly requested to write full particulars of the animal from which the specimen has been taken and to post such in time to be delivered before the arrival of the specimen, or, in case of urgency, to telegraph. The importance of doing this is urged since occasionally, when not previously advised, specimens have arrived in too decomposed a condition for examination.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
1st October, 1907.

* * * *

SPONZIEKTE OR QUARTER EVIL.

Vaccine for the prevention of this disease is now ready for issue at the Government Veterinary Bacteriological Laboratory, and can be obtained through the Government Veterinary Surgeons, who will give instruction in the method of vaccination, and through whom also the necessary instruments can be obtained. The price of the vaccine is 3d. per double dose.

* * * *

WARNING TO IMPORTERS.

The attention of the Department has been directed to the fact that certain imported cattle brought into this country under certificates stating that they have been tested with Tuberculin before shipment and have passed the test satisfactorily, have been found to react as infected when re-tested by the Government Veterinary Staff shortly after arrival. For this reason it is suggested that importers of cattle should have such imported animals re-tested by a Government Veterinary Surgeon on arrival at their destination, and before they are allowed to mix with other stock. Should anyone wish to take this precaution the test will be applied free of charge upon application to the Government Veterinary Surgeon of the District to which the cattle are taken, at the earliest convenience of this Officer to whom the application is made.

F. B. SMITH,
Director of Agriculture.

* * * *

PORTS FOR ENTRY OF STOCK.

The following are the ports for entry of stock into this Colony from the neighbouring territories :

Bührman's Drift	Cape Colony.	(Daily.)
Mosimyani	,,	(Saturdays only.)
Christiana	,,	(Daily.)
Coal Mine Drift	Orange River Colony.	(Thursdays only.)
Vereeniging	,,	(Daily.)
Schoeman's Drift	,,	(Mondays & Thursdays.)
Roberts' Drift	,,	(Daily.)
Volksrust	Natal.	(Daily.)
Komati Poort, through which stock not provided for under Clause 5, Government Notice No. 834 of 1903, will only be allowed to proceed by rail, to be examined at Machadodorp	Portuguese East Africa.	

Division of Chemistry.

SCHEDULE OF CHARGES FOR ANALYSIS MADE IN THE AGRICULTURAL LABORATORIES.

	£	s.	d.
1. Estimation of one constituent in a manure or feeding stuff ..	0	7	6
2. Estimation of two or three constituents in a manure or feeding stuff	0	15	0
3. Complete analysis and valuation of a manure or feeding stuff ..	1	0	0
4. Analysis of water—drainage or irrigation	1	5	0
5. Partial analysis of a soil to determine fertility and manurial needs	2	0	0
6. Complete analysis of a soil	3	0	0
7. Analysis of milk, cream, butter, or cheese	0	10	0
8. Milk—determination of fat and total solids	0	5	0
9. Milk—determination of fat only	0	2	6
10. Butter—determination of water and fat	0	5	0
11. Analysis of a vegetable product—hay, ensilage, roots, etc.	1	0	0

At present no charge will be made to *bona fide* farmers. The charges in the above schedule refer to products sent by manure merchants, milk dealers, or others interested in trade. Samples will only be accepted if assurance can be given that they are properly taken and truly representative of the bulk. The right of publishing the results of any analysis is reserved by the Department. Should the examination of any product furnish results which are deemed of sufficient general interest, the charges may be remitted.

Samples of any product likely to be of agricultural importance will gladly be received.

Division of Botany.

INJURIOUS WEEDS.

Owing to the fact that of late several newly-introduced and injurious weeds have made their appearance in the Transvaal, farmers are earnestly requested to take careful notice of any new plants which have appeared on their farms and which seem to have a tendency to spread. When such are discovered, specimens of the plant bearing flowers and, if possible, fruit should be forwarded to the Government Botanist by whom they will be examined and reported upon. They should be forwarded in the same way as specimens of poisonous plants.

COCKLE-BURR.

On account of the dangerous character of this weed to wool and mohair growers, farmers on the Aapjes, Pienaars, and Crocodile Rivers are advised to keep a sharp look-out for its appearance, especially on the banks of the rivers, and to root out the plants before they scatter seed. Any farmer who is in doubt as to the identity of Cockle-Burr can send specimens to the Botanist for identification.

SEED DISTRIBUTION.

A few selected varieties of Winter Wheats, grown on the Experiment Farm, Potchefstroom, are available for distribution in small quantities by the Division of Botany. Application should be made to the Government Botanist, Department of Agriculture, P.O. Box 434, Pretoria.

Division of Forestry.

SALE OF HEDGING FROM IRENE NURSERY.

It is hereby notified for general information that the sale of Hedge Plants from Irene Government Nursery has been discontinued. Forest trees will be disposed of as formerly.

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The price list of seeds and trees supplied by this Division can be obtained free of charge on application to the Conservator of Forests, or the Government Printer, Pretoria.

Division of Horticulture.

CONTINUATION OF NURSERY WORK BY THE HORTICULTURAL DIVISION.

The present opportunity is taken of notifying farmers generally that the propagation of young fruit trees for sale at the various Experimental Orchards and Nurseries of this Division will be re-commenced immediately, but trees will not be available for disposal until July, 1909. By this date it is expected that a good number of trees will be available, and they will comprise such varieties as have proved to be suitable for the various districts of the Transvaal by actual test at the different Experiment Stations.

SALE OF FRUIT TREES, VINES, CUTTINGS, SCIONS, ETC.

It is notified for public information that in future payment must be made for goods on or before delivery. When purchasers mention a railway station to which packages may be consigned for them, advantage may be taken of the "Collect on Delivery" system of the C.S.A.R. In all other cases cash should accompany the order, but it is advisable prior to remitting same that enquiries be made of the Government Horticulturist as to the ability of the Division to supply the trees ordered.

Tobacco Division.

TOBACCO PLANT DISEASES.

A large number of letters and verbal inquiries have been received by the Tobacco Division in regard to diseases and insects injurious to tobacco plants. It is impossible to give any reliable advice as to remedies for different diseases and insect pests unless a specimen of the affected plant is forwarded to us, and our readers are, therefore, requested to furnish a portion of the affected plant when writing for advice in such matters. Most of the diseases and insect pests which attack tobacco plants in the Transvaal are easily controlled. Letters, but not parcels, may be sent free of charge if addressed as follows :—

O.H.M.S.
Chief of Tobacco Division,
Department of Agriculture,
Pretoria.

Editorial Division.

AVAILABLE PUBLICATIONS.

The following publications, amongst which are included several recent additions, can be had, free of charge, on application to the Government Printer, Box 373, Pretoria :—

Transvaal Agricultural Journal,	No. 3,	Vol.	I.	(Published	quarterly).
,, ,, ,,	No. 4,	Vol.	I.	,,	,,
,, ,, ,,	No. 13,	Vol.	IV.	,,	,,
,, ,, ,,	No. 14,	Vol.	IV.	,,	,,
,, ,, ,,	No. 15,	Vol.	IV.	,,	,,
,, ,, ,,	No. 16,	Vol.	IV.	,,	,,
,, ,, ,,	No. 17,	Vol.	V.	,,	,,
,, ,, ,,	No. 18,	Vol.	V.	,,	,,
,, ,, ,,	No. 21,	Vol.	VI.	,,	,,
,, ,, ,,	No. 22,	Vol.	VI.	,,	,,

Division of Botany:—

Leaflet No. 1.—"Plants Poisonous to Stock."
,, No. 4. "The Cockle-Burr."
,, No. 6.—"Peach Leaf Curl."
Bulletin No. 1. "The Conditions of Seed and Plant Distribution," 1906-7.
,, No. 2. "The Conditions of Seed and Plant Distribution," 1907-8.
Circular No. 1. "Poisonous Plants."

Division of Entomology:—

Leaflet No. 5.—"The Fowl Tick."
,, No. 6.—"Cockchafers and Flower Beetles."
,, No. 7.—"Sprays for Locust Destruction."
,, No. 10. "Notes on Termites."
,, No. 11. "The Scale Insects of Citrus Trees."

Division of Forestry:

"Price List of Seeds and Trees."

Division of Horticulture:

Bulletin No. 1. "Some Information about Fruit Trees."
Leaflet No. 3. "A Fruit Report."
„ No. 4. "Diseases of Orange Trees."

Division of Dairying:

Leaflet No. 1. "The Making of Full-Cream Gouda Cheese on a Dutch Farm."
„ No. 2. "Treatment of Milk."
Circular No. 1.—"Breakfast Cheese."
„ No. 2. "Rennet Making."
„ No. 3.—"Buttermaking."

Division of Veterinary Science:

Bulletin No. 1. "Measles in Swine and Cattle."
„ No. 6.—"Contagious Abortion."
Leaflet No. 3. "Rhodesian Tick Fever."
„ No. 5. "Glanders and Farcy."
„ No. 4. "Directions for Preparing Blood Smears."
„ No. 6 "Wire Worms."
„ No. 7. "Directions for Use of Blue Tongue Vaccine."

Division of Publications:—

Bulletin No. 1.—"Burrweed or Boete Bosch."
„ No. 2.—"Some Diseases of the Horse."
„ No. 3.—"The Food of Plants."
„ No. 6.—"City and Town Milk Supply and the Care and Aeration of Milk" (English and Dutch).

Miscellaneous:—

Bulletin No. 3.—"The Brands Directory, 1906."
Annual Report of the Director of Agriculture for the year 1903-4.
„ „ „ „ „ 1904-5.
„ „ „ „ „ 1905-6.

JOURNAL FILES.

In order that our numerous readers may not be disappointed by being unable to complete their files, we would earnestly request them to preserve all copies of the "Journal" if they propose to bind them at the close of the year. Owing to the expense incurred in publication, it has become necessary to limit the number of copies issued, and it often happens that we cannot supply back numbers, as they are out of print.

Indices for the "Agricultural Journal," Vol. I., Vol. II., Vol. III., Vol. IV. and V., can be had on application to the Department of Agriculture.

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JOURNAL DUPLICATES.

Any readers who possess and can spare duplicates of the "Agricultural Journal" would confer a great favour by returning them to the Department of Agriculture, as back numbers are now out of print, and applications are constantly being made by persons desirous of completing their sets.

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APPLICATIONS FOR THE "JOURNAL" AND NON-DELIVERY.

Applications to be placed on the Mailing List of the "Journal," as well as complaints as to non-delivery of the "Journal," should be addressed to the Government Printer, P.O. Box 373, Pretoria, and not to the Editor of the "Journal." It is particularly requested that changes of address should also be promptly notified to the Government Printer, in order to ensure prompt delivery to addressees and to avoid unnecessary correspondence.

"The Transvaal Agricultural Journal" is issued free to residents in the Transvaal only.

Persons residing in the other South African Colonies or Oversea may become subscribers by paying an annual subscription of 7s., post free, starting from July in each year; 2s. extra is required for postage oversea.

Subscriptions are payable strictly in advance, and should be made by bank draft, money order, bank notes, or coin. Cheques cannot be accepted in payment, unless initialled by the Bank authorities.

All correspondence must be addressed and payments made to the Government Printer, Box 373, Pretoria.

General Notices.

LIST OF FARMERS' ASSOCIATIONS AND AGRICULTURAL SOCIETIES IN THE TRANSVAAL.

Aapjes River Ward Agricultural Society, A. F. van Gass, Pyramid Station.
Aapjes River Ward Farmers' Association, F. N. Carlisle, Pyramid Station.
Barberton Farmers' Association, Geo. E. O. Wilhelm, Box 157, Barberton.
Barberton Agricultural Society, G. S. Dyce, Box 5, Barberton.
Belfast Agricultural Society, O. J. Oosthuizen, Box 13, Belfast.
Bloemhof Agricultural Society, Izaak Hoffmann, Bloemhof.
Carolina Agricultural Society, M. van Enter, Box 43, Carolina.
Christiana Agricultural Society, A. P. Burgers, Box 27, Christiana, Secretary.
Crocodile River Farmers' Association, J. H. Schoeman, Rietfontein W., Pretoria.
Devon Farmers' Association, J. H. R. Moodie, P.O. Devon.
Eastern Transvaal Farmers' Association, T. W. Smith, Box 75, Springs.
Ermelo Agricultural Society, A. Smuts, Box 5, Ermelo.
Elands River Farmers' Association, E. H. Eloff, Rietvlei, Lindley's Poort, Rustenburg.
Grootspelonken Farmers' Association, J. W. Walton, Private Bag, Middagzon, Pietersburg.
Haenertsburg Farmers' Association, P. Kent, Spitzkop, Haenertsburg, *via* Pietersburg.
Heidelberg Agricultural Society, W. Harvey, Box 36, Heidelberg.
Heidelberg Burgher Land Settlements, Balfour.
Hekpoort Farmers' Association, Secretary, *via* Krugersdorp.
Hex River Farmers' Association, W. Breedt, Hex River, Rustenburg.
Highveld Farmers' Association, F. Findley, Ceylon, *via* Krugersdorp.
Highveld Farmers' Association, W. Robinson, Rustenburg.
Klerksdorp Agricultural Society, H. Bramley, Box 56, Klerksdorp.
Klip River Farmers' Association, Krugersdorp.
Koesterfontein Farmers' Association, Secretary, *via* Krugersdorp.
Krugersdorp Farmers' Association, G. Figulus, Box 188, Krugersdorp.
Krugersdorp Agricultural Society, H. A. von Blommestein, Box 368, Krugersdorp.
Lydenburg Agricultural Society, S. Hiemstra, Box 69, Lydenburg.
Lydenburg Farmers' Association, E. de Souza, Lydenburg.
Leeuwdoorns Farmers' Association, W. H. Pilkington, Baviaans Poort, *via* Leeuwdoorns.
Low Country Farmers' Association, A. W. Gale, Middelrand, P.O. Devilskloof, Zoutpansberg, N. Transvaal.
Marico Agricultural Society, S. J. van der Spuy, Box 83, Zeerust.
Maquassi Farmers' Association and Agricultural Society, A. E. Grigson, Maquassi Station.
Middelburg Agricultural Society, J. W. Henwood, Box 229, Middelburg.
New Scotland Farmers' Association, H. S. Parry, Grasdal, Lake Chrissie.
New Agatha Farmers' Association, Henry W. Molyneux, P.O. New Agatha.
Pietersburg Agricultural Society, J. W. Johnson, Box 32, Pietersburg.
Pietersburg Farmers' Association, G. G. Munnik, Pietersburg.
Pietersburg Poultry Club, H. Moore, Box 103, Pietersburg.
Piet Retief Farmers' Association, K. P. van Dijk, Box 18, Piet Retief.
Pisanghoek Farmers' Association, W. J. Birchill, Diana, *via* Pietersburg.
Platrand Farmers' Association, A. H. Barron, Platrand.
Potchefstroom Agricultural Society, Joubert Reitz, Box 152, Potchefstroom.
Potchefstroom Burgher Land Settlements: The Manager, Box 172, Potchefstroom.
Potgietersrust Fruitgrowers' and Planters' Association, H. J. Ströbel.
Pretoria Agricultural Society, H. Cornforth, Box 685, Pretoria.
Rand Poultry Club, F. H. Stoll, Box 2712, Johannesburg.
Rustenburg Farmers' Association, Leo Machol, Rustenburg.
Settlers' Association, Hon. H. Wyndham, Kroomdraai.
Southern Waterberg Farmers' Association, C. M. Quarry, P.O. Warmbaths.
Standerton Agricultural Society, J. J. Bosman, Box 26, Standerton.
Transvaal Agricultural Union, F. T. Nicholson, Box 134, Pretoria.
Transvaal Farmers' Association, E. W. Hunt, Box 3785, Johannesburg.
Transvaal Land Owners' Association, H. A. Baily, Box 1281, Johannesburg.
Transvaal Poultry Club, M. Lochhead, Box 134, Pretoria.
Transvaal Stockbreeders' Association, F. T. Nicholson, Box 134, Pretoria.
Transvaal Tobacco Growers' Association, Capt. C. A. Madge, Secretary, Box 4303, Johannesburg.

Transvaal Con. Land Company, Capt. C. A. Madge, Box 4303, Johannesburg.
Trichardts Farmers' Association, E. v. Deventer, P.O. Trichardts, Springs.
Vaal River Farmers' Association, J. van Zijl, *via* Potchefstroom.
Waterberg Agricultural Society, J. von Backstroom, Box 7. Nylstroom.
Wakkerstroom Agricultural Society, G. Maasdorp, Box 87, Volksrust.
Witfontein Farmers' Association, J. Krugel, *via* Krugersdorp.
Witwatersrand Farmers' Association, H. J. A. Wentworth, P.O. Craighall, near Johannesburg.
Witwatersrand Dairy Farmers' Association, Alex. Sloan, Box 5908, Johannesburg.
Witwatersrand Agricultural Society, W. H. Poultney, Box 4344, Johannesburg.
White River Farmers' Association, Archibald T. Ralls, White River, *via* Nelspruit.
Wolmaransstad Farmers' Association, F. W. Konig, Box 1, Wolmaransstad.
Wolmaransstad Agricultural Society, W. D. de Greef, Wolmaransstad.
Wonderfontein Farmers' Association, Secretary, *via* Krugersdorp.
Woodbush Farmers' Association, Secretary and Treasurer, Percy Kent, Spitskop, P.O. Haenertsburg.
Zwartkop Farmers' Association, M. Vorster, Zwartkop, *via* Krugersdorp.
Zwartruggens Farmers' and Planters' Association, G. R. Wedderburn, J.P., Broadwood Vale, P.O. Kosterfontein. Rustenburg.
Zoutpansberg Agricultural Society, J. W. Johnston, Box 32, Pietersburg.

OTHER COLONIES.

Agricultural Union of Cape Colony, D. M. Brown, Box 187, Port Elizabeth.
Bloemfontein and O.R.C. Agricultural Society, J. Fraser, Box 250, Bloemfontein.
Cape Central Farmers' Association, H. C. Hall, Bedford, Cape Colony.
Cape Stud Breeders' Association, J. Pike, Box 703, Capetown.
Natal Agricultural Union, D. M. Eadie, Timber Street, Pietermaritzburg.
Orange River Colony Central Farmers' Association, W. B. Fowler, Secretary, Hill's Buildings, Maitland Street, Bloemfontein.
Orange River Colony Stockbreeders' Association, Secretary, Bloemfontein.
Rhodesian Agricultural Union, Secretary, Box 135, Salisbury, Rhodesia.
South African Co-operative Union, A. C. Lyell, Box 574, Bloemfontein, O.R.C.
Upper Klip River Farmers' Association, Secretary, Vrede District, O.R.C.

TRANSVAAL LAND AND AGRICULTURAL BANK.

Application for Loans.

It is hereby notified for general information that applications for loans from the Transvaal Land and Agricultural Bank will be received on and after the 4th November, 1907.

The Offices of the Bank have been opened at the Bourke Trust Chambers, Church Square, Pretoria, and all business must be done personally or through a Resident Magistrate, Assistant Resident Magistrate or Resident Justice of the Peace.

Forms of application are now ready and can be obtained from the Officials of the Bank and all Magistrates.

It is to be particularly observed that all applications should be made and lodged by the Applicants themselves, and not through Agents or second parties, and applications made by any other parties than the Applicants themselves will not be considered or acknowledged.

The Officials of the Bank and Magistrates will give all required information and will render all necessary assistance in the completion of forms of the application and otherwise.

Loans not exceeding in amount 60 per cent. of the agricultural and pastoral value will be made upon the security of freehold and quitrent land, and not exceeding 50 per cent. of its value, upon the security of land held under the Occupation Law.

The advances may be obtained either as a fixed loan repayable in one sum after a period not exceeding five years or as an instalment loan repayable by half-yearly instalments during a period not exceeding twenty-five years, with interest calculated at a rate not exceeding 6 per cent. per annum.

Except in special cases no advances will be made of amounts less than £50 and exceeding £2,500.

Insurance will not be specially required for the purposes of these loans as the advances will be made upon the basis of the value of the land irrespective of buildings.

Loans to Co-operative Societies which have been approved by the Minister of Agriculture will be made both on a fixed and instalment basis upon the value of raw or manufactured produce for the purposes and upon the conditions set forth in Section 30 of the Land and Agricultural Bank Act No. 26 of 1907.

All applications for loans must be accompanied by:

(1) A valuation of the property offered as security which should be made by a person duly approved of by the Magistrate.

(3) Fees upon the following scale:

On application not exceeding £200	£1
On application exceeding £200 and not exceeding £500 ...	£2
On application exceeding £500 and not exceeding £1,000 ...	£3
and for every additional £1,000 or part thereof... ...	£1

In the event of the loan being declined without any special valuation of the property having been made the fees less 10s. will be returned.

THOS. B. HEROLD,
Chairman.

Office of the Transvaal Land and Agricultural Bank,
Bourke Trust Chambers, Church Square,
Pretoria, 16th October, 1907.
P.O. Box 375.

LIST OF OFFICIALS.

The following is a list of the officials of the Transvaal Department of Agriculture, to whom inquiries respecting matters connected with agriculture may be addressed:—

The Right Hon. the Minister of Agriculture	General Louis Botha.
Director	F. B. Smith.
Division of Veterinary Science:	
(*a*) Bacteriology	A. Theiler.
(*b*) Contagious Diseases	C. E. Gray.
Division of Chemistry	Herbert Ingle.
Division of Botany	J. Burtt-Davy.
(*a*) Plant Pathology	I. B. Pole-Evans.
(*b*) Seed Introduction and Plant Experiments	H. G. Mundy.
Division of Forestry	Charles E. Legat.
Division of Entomology	C. W. Howard.
Division of Horticulture	R. A. Davis.
Division of Tobacco	J. van Leenhoff.
Division of Co-operation	B. Stilling-Andersen.
Division of Dairying	Robert Pape.
Division of Publications	William Macdonald.
Division of Poultry	Reginald Bourlay.
Government Experimental Farm, Potchefstroom	Alexander Holm.
Government Stud Farm, Standerton	A. McNae
Government Stud Sheep Farm, Ermelo	V. Bossley.
Government Experimental Farm, Tzaneen	Walter H. Charter.
Translator	Otto Menzel.
Registrar of Brands	J. J. Pienaar.
Librarian	S. W. Wagstaff.

ADDRESS.

Correspondents are earnestly requested to give their full name and correct postal address when forwarding any communication to the Department. It sometimes happens that readers send their farm address only, and fail to give the Post Office address, consequently it is impossible to reply to their queries or send publications. This refers more especially to farmers applying for cattle permits, as in many cases letters forwarded by the Veterinary Division are returned by the Postal Authorities to the effect "Not delivered. Address insufficient." The Department should also be immediately notified of any change of address.

AGRICULTURAL SHOWS.

At the recent Conference of the Transvaal Agricultural Union the following dates were provisionally fixed for Agricultural Shows to be held in the Transvaal during the year 1908 :—

Heidelberg	15th April.
Marico...	22nd April.
Johannesburg	29th April to 2nd May.
Pietersburg	13th May.
Nylstroom	22nd May.
Pretoria	End of May or beginning of June.
Barberton	July.

* * * *

SOUTH AFRICAN STUD BOOK.

A record of all classes of stock, the object being to encourage the breeding of thoroughbred stock and to maintain the purity of breeds, thus enhancing their value to the individual owner and to the country generally.

Application for membership and entries of stock should be addressed to—

For Cape Colony—J. Pike, P.O. Box 703, Capetown.
For Transvaal—F. T. Nicholson, P.O. Box 134, Pretoria.
For Orange River Colony—E. J. MacMillan, Government Buildings, Bloemfontein.

The South African Stud Book, Volume I., is obtainable from T. Maskew Miller, Adderley Street, Capetown. Price, 10s. 6d.

J. PIKE, *Secretary,*
South African Stud Book Association.

* * * *

DEPARTMENT OF IRRIGATION.

ADVICE TO FARMERS.

It is hereby notified for general information that the Irrigation Department is prepared to give advice to farmers on any farm relative to irrigation problems, in accordance with regulations approved by the Hon. the Minister for Lands.

Farmers are expected to facilitate the transport of the Irrigation Officials from farm to farm wherever possible.

Application should be made by letter to the Chief Engineer, Irrigation, or to the Resident Magistrate of the District.

F. A. HURLEY,
Chief Engineer, Irrigation.

* * * *

C.S.A.R. FRESH COLONIAL PRODUCE DIRECT FROM THE FARM.

TO FARMERS.—Dairy farmers and others, who send fresh butter by rail, are recommended to take the following precautions, especially during the summer months :

The butter should be packed up in parcels of 1 lb. or 2 lbs. weight, and covered with linen steeped in a solution of salt. The small parcels should be wrapped in a blanket or woollen cloth, steeped in a similar solution. The blanket containing the butter should be placed inside a box, which should be covered with gunny or grain bags or similar material, also steeped in a solution of salt. If the butter is packed in this way, and received in a moist condition at the railway station, experience has shown that it can be sent by rail for many hundreds of miles in excellent condition. Farmers are recommended not to expose the boxes to the sun in the conveyance of the cases in wagons or carts to the station, and if there is any complaint that during the time they are in the hands of the Railway Department they are exposed to the sun, any representations addressed to the Traffic Manager will receive prompt attention.—T. R. PRICE, General Manager, C.S.A.R.

The following is a list of colonial producers who are willing to supply produce, such as butter, eggs, poultry, vegetables, fruit and meat, at reasonable prices direct from the farm to the consumer :—

Name of Producer.	Address.	Description of Article for Sale.	Quantity.	Price.	Date Available.
Mr. R. Archibald ...	Box 66, Barberton ...	Tomatoes, Cabbage, Lettuce, Beet, Celery	6 baskets assorted ...	Market prices ...	Daily.
Mr. Lovemore ...	Christiana...	Butter	40 lbs. weekly ...	1/6 per lb. ...	Now.
Mr. van der Riet ...	Christiana...	Butter	20 lbs. weekly ...	1/6 per lb. ...	"
Fruit Growers and Planters Association	Potgietersrust	Cut Flowers, Eggs, Fowls, Vegetables, Oranges, &c.	Particulars on application	—	—
E. Hampton	P.O., Warmbaths	Sucking Pigs (dressed) ...	30	10/- each ...	Now.
		Eggs	—	1/6 doz. ...	"
H. E. Tomlinson ...	Springbok Flats, Bangor (Settlers Siding)	Mealies	150 bags, white ...	Market prices ...	"
			150 bags, yellow ...	" "	"
James Taylor	Springbok Flats, Benwells (Settlers Siding)	Hickory King Mealies ...	170 bags	" "	"
Jno. Dyason	Wonderfontein, Dis. Marico	Sifted Boer Meal	—	22/6, 24/6 bag ...	"
		Wheat	—	20/- per bag ...	"
		Forage	—	5/6 and 3/9 100 lbs.	"
		Fowls and Ducks	—	2/6 each ...	"
		Tree Ferns	—	" ...	"
		Maiden Hair Ferns ...	500 in a box ...	5/- per box ...	"
Jas. Dundas	P.O., Christiana	Butter	30 lbs.	1/6 per lb. ...	Weekly.
G. & W. Topham ...	P.O., Remhoogte	Mealies, white and yellow, Fresh Butter and Cream	Particulars on application	—	Now.
W. R. Davies	Boschrand Farm, Ferreira	Milk...	100 bottles a day	—	—
		Eggs	12 doz. weekly ...	On application ...	Now.
Wm. E. Clarke ...	P.O., Trichardts	Butter	30 to 80 lbs. weekly	1/6 per lb. ...	"
		Cream	15 to 20 gals. weekly	On application ...	"
		Hickory King Mealies ...	500 bags	"	"
		Yellow Cango Mealies ...	100 bags	"	"
P. O. Swan	Klip River	Milk	—	J'h'nesburg prices	"
J. N. Williams ...	"	Peaches, Apples and Oranges	—	"	In summer
W. J. Kock	"	" " ...	—	"	"
R. S. M. Royston ...	P.O., Davel	Fresh Butter, Cream and New Potatoes	Particulars on application	On application ...	Now.
R. Dell	"	Fresh Butter and Cream ...	" "	"	"
C. Jacobsz	"	" "	" "	"	"

Intending purchasers should order their supplies direct from the farmer. The produce will, if desired, be conveyed over the railway on the C.O.D. system, *i.e.*, the purchaser pays THE COST OF THE PRODUCE, as well as the railage, to the Railway Department on delivery, the Department then remitting the purchase price to the farmer.

Farmers with suitable produce to dispose of, either now or in the future, are requested to supply the local Station Master with their names and addresses, together with details of their commodities for insertion in the next issue of this notice.

Government Proclamations and Notices.

No. 93 Admn. 1907.]

PROCLAMATION

BY HIS EXCELLENCY THE GOVERNOR OF THE TRANSVAAL.

Whereas by Proclamation No. 2 Admn. of 1906 dogs were prohibited within a zone of fifty miles in width extending *inter alia* along the Crocodile River in the Districts of Waterberg and Rustenburg herein referred to as the prescribed zone in order to provide against the introduction of Rabies into this Colony;

And whereas the circumstances set forth in the preamble to the said Proclamation continue to exist;

And whereas it has been represented by stock farmers residing within the prescribed zone that they are suffering heavy losses by reason of the destruction of their stock by vermin;

Now therefore under and by virtue of the powers in me vested by section *one* of the Rabies Ordinance 1904 I do hereby declare proclaim and make known that every farmer within the prescribed zone shall be entitled to keep two dogs for the protection of himself and his stock subject to the approval of Committees of Control for each such district consisting of such persons as the Minister of Agriculture may by notice in the *Gazette* appoint and to the regulations herein set forth.

1. The members of each Committee shall have the power to enforce any such regulations or any amendments or alterations thereof or any further regulations that the Governor in Council may hereafter make.

2. Every owner of a dog which is within the prescribed zone shall on or before the thirty-first day of December 1907 register the same with a member of the Committee and obtain from him a special permit. Such permit shall bear a full description of every dog in respect of which it is issued and shall not be transferable.

3. Any person in possession of any dog within the prescribed zone shall upon demand by any member of the Committee or of a police officer or constable produce a permit issued under these regulations to keep such dog.

4. Any member of the Committee may order and cause the destruction of any stray dog or any dog for which any such permit is not produced.

5. If any dog shows signs of sickness the fact shall immediately be reported to some member of the Committee; and any member may order the destruction of any dog suffering from sickness which in his opinion resembles or may develop into Rabies or may order such dog to be placed in quarantine and kept under observation. In the case of a dog so destroyed its brains shall immediately be forwarded to the Government Veterinary Surgeon or the nearest police post; and in the case of a dog placed in quarantine and kept under observation the result of the observations shall be transmitted to the Government Veterinary Surgeon and such action shall be taken with regard to it as the Minister of Agriculture may determine.

6. Any person contravening any of these regulations shall be guilty of an offence and liable on conviction to a fine not exceeding ten pounds sterling or in default of payment thereof to imprisonment with or without hard labour for a period not exceeding one month.

GOD SAVE THE KING.

Given under my Hand and Seal at Pretoria this Seventh day of December One thousand Nine hundred and Seven.

SELBORNE.
Governor.

By Command of His Excellency the Governor in Council.

LOUIS BOTHA.
Minister of Agriculture.

GOVERNMENT NOTICE No. 1343 OF 1907.

PREVENTION OF RABIES.

It is hereby notified for general information that, in accordance with the provisions of Proclamation No. 93 Admn. of 1907, His Excellency the Governor, with the advice of the Executive Council, has been pleased to approve of the appointment of a Committee of Control for the District of Waterberg, to administer the Regulations contained in the said Proclamations.

His Excellency the Governor has been pleased further to appoint the following gentlemen to be members of such Committee of Control:—

Jacobus Johannes Geldenhuys, of Oranjefontein 491;
Phillipus Arnoldus Eloff, jun., of Kruispad 1522;
Thomas Bourke, of De End 424;

Johannes Lodewicus Lee, of Waterkloof 498 ;
Cornelius Johannes van Vuuren, of Oranjefontein 491 ;
Johannes Willem Haremse, of Giftboschpan 1481 ;
George Cameron, of Claremont 1109 ;
Christoffel Lombard, of Beauty 2228 ;
Marthinus Phillipus van Staden, of Zoutpan 1238 ;
Gert Johannes Vermaak, of Giftboschpan 1481 ; and
C. Maritz, of Witkopje 658 ;

all of whom are resident in the District of Waterberg.

Office of the Director of Agriculture,
Pretoria, 10th December, 1907.

F. B. SMITH,
Director of Agriculture.

* * * *

NOTICE No. 695 of 1907.

Under and by virtue of Section 35 of the Customs Management Ordinance of 1902, I do hereby notify that all Government Veterinary Surgeons and Stock Inspectors of the Department of Agriculture are Officers of Customs for the purpose of controlling the importation and exportation of live stock into and from this Colony, and for obtaining all particulars in respect to the same.

Office of the Director of Customs,
Pretoria, 2nd October, 1907.

J. W. HONEY,
Director of Customs.

* * * *

GOVERNMENT NOTICE No. 1186 OF 1907.

It is hereby notified for general information that, in order to promote the breeding of pure-bred stock, the following prizes will be offered by the Department of Agriculture at Agricultural Shows held in the Transvaal during the ensuing season :—

(1) Gold Medal, value £4 4s., for best colt or filly, under three years of age, got by a stallion the property of, or purchased from, the Department of Agriculture.

(2) Gold Medal, value £4 4s., for best pair of steers (oxen) or best pair of heifers, under three years of age, got by a bull the property of, or purchased from, the Department of Agriculture.

(3) Gold Medal, value £2 2s., for best two sheep, under two years of age, got by a ram the property of, or purchased from, the Department of Agriculture.

(4) Gold Medal, value £2 2s., for best two pigs, under two years of age, got by a boar the property of, or purchased from, the Department of Agriculture.

Conditions of Award :—

(1) Exhibits must have been bred by the exhibitor, and each entry must be accompanied by a certificate giving the particulars of the sire and the dam, or dams, of the animals entered.

(2) Any animal or animals which have won these prizes once shall not be eligible to compete again for the same prize, except at the Show of the Witwatersrand Agricultural Society.

(3) Any dispute arising on any of these conditions shall be referred to the Director of Agriculture, and his decision shall be final.

(4) Judges are requested to place the second in order of merit, where there is competition.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 22nd October, 1907.

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GOVERNMENT NOTICE No. 1 OF 1908.

It is hereby notified for general information that His Excellency the Governor has been pleased to approve of the appointment of the persons mentioned in the subjoined Schedule as Field Cornets in the Transvaal from the 1st January, 1908.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
Pretoria, 1st January, 1908.

APPOINTMENT OF FIELD CORNETS.

PIET RETIEF :—

Piet Retief—Jan Christoffel Greyling Kemp, Box 10, Piet Retief.
Assegaai River—Heinrich Martin Friedrich Meyer, P.O. Wittenberg.

WAKKERSTROOM :—

Wakkerstroom—Gerhardus Johannes Janse van Rensburg, Poortje, P.O. Vaalbank, Wakkerstroom.
Amersfoort—Gabriel Michael Carel Swart, Vaalbank, Amersfoort.
Volksrust—Christian Burger Pringle, P.O. Volksrust,

STANDERTON :—
Blesbokspruit—Hendrik Johannes Janse van Vuren, Rietvlei, P.O. Blesbokspruit.
Waterval—Johannes Joachim Alberts, Klipdrift, P.O. Val Station.
Klip River—Coenraad Jacobus Brits, Leeuwkraal, P.O. Platrand Station.
Steenkoolspruit—Adam Gilfillan, Dorstfontein, P.O. Onverwacht.
Bethal—Petrus Johannes Dirk Erasmus, Groenpunt, P.O. Bethal.

ERMELO :—
Ermelo—Abraham Gerhardus Kleynhans, Vleiplaats, P.O. Brakfontein.
Amsterdam—Johannes Nicholaas Hermanus Grobler, P.O. Bankkop.
Lake Chrissie—Barend Jacobus Johannes Smit, Box 56, Ermelo.

CAROLINA :—
Carolina—Johannes Hieronimus Brink, P.O. Box 37, Carolina.
Theespruit—William Hendrik de Villiers, P.O. Carolina.
Komati River—Johannes Lodewikus Grobler, Drenthe, P.O. Dalmanutha Station.

BARBERTON :—
Barberton—Hendrik Thomas Watkins, P.O. Bonnefoi, Carolina.
White River—Paul Michiel Marits, Kaapsche Hoop.

LYDENBURG :—
Steelpoort—Jacobus Nieuwenhuize, Rietfontein, P.O. Boschfontein.
Ohrigstad—Pieter Barend Swart, Uitkomst, P.O. Rustplaats.
Krokodil—David Johannes Schoeman, Rietfontein School, P.O. Rietfontein.
Steenkampsberg—Christiaan Cornelius Cloete Joubert, P.O. Dulstroom (*pro tem.*).

MIDDELBURG :—
Olifant's River—Gerhardus Wilhelmus van Niekerk, Goedehoop, P.O. Vaalkrants.
Steenkoolspruit—Joachim Johannes Cornelis van Niekerk, Doornrug, P.O. Balmoral.
Mapochsgronden—Adam Johannes Willemse, P.O. Tonteldoos.
Selons River—Josias Servaas de Kock, Box 3, Middelburg.
Secocoenicsland—Christian Ernst Schutte, Rietfontein, P.O. Pokwani.

ZOUTPANSBERG :—
Mara (North)—Marthinus Johannes Petrus Biermann, Bergplaats, P.O. Mara.
Mara (South)—Andries Stephanus David Erasmus, Smitsplaats, P.O. Pietersburg.
Marabbastad—Christoffel Hofmeyr, P.O. Marabbastad.
Olifants—Ernst Lodewikus Marais, De Diepte, P.O. Chuniespoort.
Groot Spelonken—Johannes Frederik Lodewikus Janse van Rensburg, Rustfontein, P.O. Buffels.
Klein Spelonken—Pieter Willem Möller, Groblerplaats, P.O. Louis Trichardt.
Woodbush—Austin Welsh Wienand, Laatstehoop, P.O. Smitsdrift.
Low Country, Klein Letaba—Jacob Cornelius Boltman, Korthanie, P.O. Duivelskloof.

PRETORIA :—
Crocodile River—Marthinus Nicholaas Riekert, Hartebeestpoort, P.O. Rietfontein West.
Witwatersrand—Johannes Lodewijk Pretorius, Vierfontein Station, P.O. Irene Station.
Bronkhorstspruit—Jacobus van der Walt, Knoppiesfontein, P.O. Bapsfontein.
Elands River—Pieter Lafras Uys, Rietfontein, Elands River Station.
Aapies River—Johannes Barend Wolmarans, Donkerhoek, P.O. Van der Merwe Station.

RUSTENBURG :—
Hex River—Georg Heinrich Wilhelm Behrens, P.O. Bethanie.
Elands River—Roelof Jacobus Petrus van Tonder, Olievenkloof, P.O. Pella.
Highveld—Pieter Stephanus Steenekamp, P.O. Cyferbult.
Zwart Ruggens—Petrus Jacobus van der Walt, Witrand, P.O. Koster.

HEIDELBERG :—
Roodekoppen—Andries Jacobus Greyling, Roodewal, P.O. Greylingstad Station.
Highveld—Willem Francois Pretorius, Rietfontein, P.O. Devon Station, *via* Springs.
Suikerboschrand—Johannes Stephanus Fourie, Boschfontein, P.O. Heidelberg.
Klip River—William George Devenish, Witkoppies, Meyerton.

KRUGERSDORP :—
Krugersdorp—Nicholaas Jacobus Pretorius, jun., Hartebeesthoek, P.O. Scheerpoort, Pretoria.
Witwatersberg—Frederik Jacobus Potgieter, Nooitgedacht, P.O. Hekpoort.
West Rand—Christoffel Frederik Theodorus Hendrikz, Luipaardsvlei, P.O. Randfontein.

POTCHEFSTROOM :—
Upper Mooi River—Stephanus Gottfried Kriegler, P.O. Frederikstad.
Gats Rand—Jacob Francois van der Merwe, Leeuwpoort, P.O. Kraalkop.
Vaal River—Nicholaas Marthinus Prinsloo, Modderfontein, P.O. Lindequesdrift.
Upper Schoonspruit—Daniel Johannes Ysel, Elandskuil, P.O. Ventersdorp.
Lower Schoonspruit—Pieter Jacobus Jooste, Box 5, Hartebeestfontein.

MARICO :—

Bushveld—Francois Johannes Diederik Furstenburg, Witpoortje, Zeerust.
Klein Marico—Daniel Lourens Botha, Weltevreden, P.O. Box 97, Zeerust.
Groot Marico—Lourens van Niekerk, Doornkraal, P.O. Wonderfontein.
Highveld—Willem Adriaan Lombard, Rietspruit, P.O. Grootafdeeling.
Moloppo—Charles Pieter Marais, P.O. Ottoshoop.

LICHTENBURG :—

Zoutpan—Andries Petrus Visser, Leeuwpan, P.O. Barberspan.
Lower Harts River—Hendrik Cornelis Wilhelmus Vermaas, jun., Post Bag Doornpoort, P.O. Hartebeestfontein.
Upper Harts River—Gabriel Johannes Greeff, P.O. Manana.

BLOEMHOF :—

Schweizer Reneke—Louis Elwin Lauritz Mussmann, P.O. Schweizer Reneke.
Christiana—Paul Johannes Maré, Grootplaats, P.O. Christiana.
Bloemhof—Pieter de la Rey Swartz, Vierfontein, P.O. Bloemhof.

WOLMARANSSTAD :—

Upper Ward—Wouter Cornelis Justinus Brink, Vlakfontein, P.O. Zendelingsfontein.
Lower Ward—Sarel Petrus du Toit, Wildebeestkantoor, P.O. Leeuwdoorns.

WATERBERG :—

Koedoesrand and Zoutpan—Marthinus Phillippus van Staden, Zoutpan, Zandrivierspoort.
Zwagershoek—Christoffel Bernardus Swanepoel, Knopfontein, Post Bag L. J. J. de Villiers, Hartebeestfontein.
Nylstroom—Hermanus Stephanus Lombard, Grootvlei, Box 21, Nylstroom.
Potgieters—Daniel Petrus van Rooyen, P.O. Potgietersrust.

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PORT OF ENTRY STATISTICS FOR THE HALF-YEAR 1ST JULY, 1907, TO 31ST DECEMBER, 1907.

Port of Entry.	Number presented at port.	For Slaughter.	For Stocking.	Transport to and fro.	Number passed.	Number rejected.
HORSES—						
Mosymiani	163	—	12	151	163	—
Volksrust	926	—	922	—	922	4
Vereeniging	1,562	—	1,410	141	1,551	11
Roberts Drift	437	—	118	319	437	—
Buhrmans Drift ...	109	—	10	98	108	1
Coal Mine Drift ...	90	—	—	90	90	—
Christiana	455	—	281	174	455	—
Schoemans Drift ...	1,098	—	6	1,092	1,098	—
	4,840	—	2,759	2,065	4,824	16
MULES—						
Mosymiani	54	—	2	52	54	—
Volksrust	77	—	77	—	77	—
Vereeniging	556	—	516	39	555	1
Roberts Drift	68	—	8	60	68	—
Buhmans Drift ...	50	—	3	47	50	—
Coal Mine Drift ...	38	—	—	38	38	—
Christiana	379	—	329	50	379	—
Schoemans Drift ...	442	—	—	442	442	—
	1,664	—	935	728	1,663	1
DONKEYS—						
Mosymiani	338	—	3	335	338	—
Volksrust	11	—	11	—	11	—
Vereeniging	686	—	686	—	686	—
Roberts Drift	—	—	—	—	—	—
Buhrmans Drift ...	260	—	62	198	260	—
Coal Mine Drift ...	110	—	—	110	110	—
Christiana	1,219	—	1,076	143	1,219	—
Schoemans Drift ...	59	—	—	[illegible]	59	—
	2,688	—	1,838	845	2,688	—

PORT OF ENTRY STATISTICS.—(*Continued*).

Port of Entry.	Number presented at port.	For Slaughter.	For Stocking.	Transport to and fro.	Number passed.	Number rejected.
CATTLE—						
Mosymiani	550	—	550	—	550	—
Volksrust	—	—	—	—	—	—
Vereeniging	17,106	12,264	4,635	—	16,899	207
Roberts Drift	1,261	528	738	—	1,261	—
Buhrmans Drift ...	520	331	189	—	520	—
Coal Mine Drift ...	337	72	265	—	337	—
Christiana	6,742	2,528	4,214	—	6,742	—
Schoemans Drift ...	206	59	147	—	206	—
	26,722	15,782	10,733	—	26,515	207
SHEEP—						
Mosymiani	966	—	966	—	966	—
Volksrust	5,715	536	5,177	—	5,713	2
Vereeniging	101,653	84,518	17,135	—	101,653	—
Roberts Drift	4,360	2,497	1,863	—	4,360	—
Buhrmans Drift ...	2,774	516	1,470	—	1,986	788
Coal Mine Drift ...	1,536	2	1,534	—	1,536	—
Christiana	93,764	78,235	15,529	—	93,764	—
Schoemans Drift ...	190	75	115	—	190	—
	210,958	166,379	43,789	—	210,168	790
GOATS—						
Mosymiani	1,556	—	1,556	—	1,556	—
Volksrust	2,705	—	2,705	—	2,705	—
Vereeniging	6,134	3,574	2,560	—	6,134	—
Roberts Drift	420	—	420	—	420	—
Buhrmans Drift ...	1,372	148	1,173	—	1,321	51
Coal Mine Drift ...	635	3	632	—	635	—
Christiana	7,143	4,939	2,204	—	7,143	—
Schoemans Drift ...	248	—	248	—	248	—
	20,213	8,664	11,498	—	20,162	51
SWINE—						
Mosymiani	—	—	—	—	—	—
Volksrust	4,184	4,175	4	—	4,179	5
Vereeniging	6,906	6,853	53	—	6,906	—
Roberts Drift	20	1	19	—	20	—
Buhrmans Drift ...	—	—	—	—	—	—
Coal Mine Drift ...	4	—	4	—	4	—
Christiana	—	—	—	—	—	—
Schoemans Drift ...	—	—	—	—	—	—
	11,114	11,029	80	—	11,109	5
Total ...	278,194	201,854	71,632	3,638	277,124	1,070
Non-proclaimed ports..	14,494	3,226	7,750	2,777	13,753	741
Grand Total ...	292,688	205,080	79,382	6,415	290,877	1,811

NON-PROCLAIMED PORT OF ENTRY STATISTICS FOR THE HALF-YEAR ENDED 31st DECEMBER, 1907.

Class.	Number presented at port.	For Slaughter.	For Stocking.	Transport to and fro.	Number passed.	Number rejected.
Horses	1,390	—	30	1,360	1,390	—
Mules	1,131	—	6	1,125	1,131	—
Donkeys	335	—	43	292	335	—
Cattle	2,044	1,025	1,019	—	2,044	—
Sheep	7,159	2,002	4,751	—	6,753	406
Goats	2,435	199	1,901	—	2,100	335
Swine	—		—	—	—	—
Total ...	14,494	3,226	7,750	2,777	13,753	741

Experimental Farm, Potchefstroom.

STALLION AT STUD.

The "Clydesdale" Stallion "Transagric," sire Royal Chief, dam Minnie (Vol. 28), by Baron's Pride (9,122), grand dam Brenda II. (12,871), by McGregor (1,487), will stand at Stud at the Experimental Farm, Potchefstroom, at the service fee of £2 2s., payable at the time of service.

"Transagric" won the gold medal at the Johannesburg Show of the Witwatersrand Agricultural Society, 1907, for the best Clydesdale exhibited. He is a black horse, about 16 hands 1 inch, on strong and short limbs, and full of substance and quality. He is recommended for breeding horses for van or draught purposes.

Arrangements can be made with the General Manager, Experimental Farm, Potchefstroom, for mares to remain at the farm during the service season at reasonable charges for keep and attendance.

* * * *

PIGS FOR DISPOSAL.

Boars of the Large White Yorkshire and Large Black breeds, about 6 months old, price 60s. to 70s. each, f.o.r. Potchefstroom, according to size and quality.

* * * *

SEEDS FOR DISPOSAL.

Wheat.—"Fourie" and "Potchefstroom White" (early varieties).
Oats.—"White Egyptian" and "Algerian."
Barley.—"Kinver Chevalier" (malting).
Rye.—"Early."

The price of wheat, barley and rye is 12s. 6d. per 100 lbs., and oats 10s. per 100 lbs., f.o.r. Potchefstroom. These "seeds" have all been carefully winnowed and dressed for seed purposes, and are free from "smut" and "bunt."

The amount which will be issued to any one farmer will be determined by the applications received, and allotment will be made according to priority of application. Orders *must be accompanied* by cheque or postal order. For full particulars and any other information apply to the General Manager, Experimental Farm, Potchefstroom.

TRANSVAAL METEOROLOGICAL DEPARTMENT.

OBSERVATIONS OF TEMPERATURES (FROM SELF-REGISTERING THERMOMETERS IN STEVENSON SCREENS).—DECEMBER, 1907.

PLACE.	FOR THE MONTH. Mean Max.	Mean Min.	Mean.	HIGHEST.	LOWEST.
	degs.	degs.	degs.	degs.	degs.
Barberton	80·4	62·3	71·4	99·6 on 20th	56·5 on 23rd
Christiana	85·7	59·6	72·6	98·0 „ 27th	48·0 „ 29th
Johannesburg—					
Joubert Park ...	75·5	55·3	65·4	83·8 „ 18th	48·0 „ 29th
Observatory ...	72·6	54·1	63·4	79·3 „ 21st	45·8 „ 9th
Pretoria, Arcadia ...	81·9	57·9	69·9	89·2 „ 26th	52·3 „ 29th
Standerton (Beginsel) ...	77·0	51·2	64·1	83·5 „ 26th & 28th	40·0 „ 29th
Zeerust	84·3	61·0	72·6	92·6 „ 26th	54·5 „ 9th

Temperatures were normal for the month, with an absence of extreme readings.

RAINFALL RETURN FOR DECEMBER, 1907.

(Including Rainfall since 1st July last and the corresponding averages.)

NOTE.—The rainy season is measured from 1st July in one year to the 30th June in the next.

DISTRICT.	PLACE.	MONTH. Dec., 1907. Ins.	Days.	SEASON. From 1st July, 1907. Ins.	Days.	AVERAGES. Month. Ins.	Days.	Season. Ins.	Days.
Barberton ...	Barberton	2·73	12	9·75	43	4·04	12	12·16	34
Bethal ...	Bethal	4·29	14	15·26	45	3·07	12	11·65	38
Bloemhof ...	Bloemhof	2·53	10	10·16	35	2·40	8	6·18	25
	Christiana	3·12	10	—	—	—	—	—	—
Carolina ...	Carolina	2·12	9	14·08	34	4·71	—	13·72	—
Ermelo ...	Ermelo	2·54	11	14·33	42	4·83	16	15·00	48
	De Hoop...	5·56	17	19·04	62	—	—	—	—
Heidelberg ...	Heidelberg	3·92	11	14·44	43	4·27	11	12·01	34
	Vereeniging	3·45	13	13·78	41	3·03	12	9·86	36
Lichtenburg	Lichtenburg	3·94	9	9·75	29	3·61	11	7·31	29
Lydenburg ...	Pilgrims Rest	3·01	14	12·77	54	4·88	18	11·89	52
	Belfast	4·00	11	13·97	42	6·08	17	14·70	52
Marico ...	Zeerust	4·13	10	11·17	26	3·00	11	9·12	30
Middelburg ...	Middelburg	4·97	13	14·91	40	3·87	12	13·01	39
Potchefstroom	Klerksdorp	2·47	13	7·74	39	3·25	10	7·97	31
	Potchefstroom	3·69	10	10·76	34	3·66	12	9·40	32
Pretoria ...	Govt. Buildings, Pretoria	2·77	10	13·07	37	3·27	11	9·62	31
	Arcadia, Pretoria ...	2·85	12	13·42	41	3·85	14	11·25	36
Standerton ...	Beginsel	7·43	9	19·00	39	2·54	10	11·73	32
Swaziland ...	Mbabane	8·97	19	23·95	65	7·37	17	18·93	59
Wakkerstroom	Volksrust	4·83	12	16·89	48	5·01	14	13·19	41
	Wakkerstroom	6·21	8	15·02	33	4·14	10	12·93	38
Waterberg ...	Nylstroom	2·27	9	7·52	25	4·37	12	9·65	29
	Potgietersrust	4·07	13	9·20	29	5·74	11	11·59	28
Witwatersrand	Krugersdorp	3·63	13	11·44	42	—	—	—	—
	Joubert Park, J'burg ...	4·06	14	15·16	46	4·77	14	14·17	38
	Govt. Observatory, J'burg	4·24	14	14·25	45	3·95	14	11·78	37
Wolmaransstad	Wolmaransstad	3·80	15	9·11	37	2·36	11	5·91	23
Zoutpansberg	The Hospital, Pietersburg	2·19	8	7·19	23	4·73	10	9·12	25

During the first half of the month the rainfall was good; during the rest of the month there were only very light showers, and some complaints of the lack of water are being made. One heavy storm, with hail, passed over a narrow tract of country and did some damage.

Observations of Temperatures (from Self-registering Thermometers in Stevenson Screens).—January, 1908.

Place.	For the Month. Mean Max.	Mean Min.	Mean.	Highest.	Lowest.
	degs.	degs.	degs.	degs.	degs.
Bloemhof	86·3	59·3	72·8	99·2 on 18th	45·0 on 2nd
Johannesburg— Observatory ...	77·0	55·0	66·0	86·1 " 20th	43·8 " 2nd
Komati Poort	95·3	68·5	81·9	109·0 " 15th	59·0 on 4th & 23rd
Pietersburg	83·1	58·5	70·8	94·0 " 12th & 18th	50·0 on 5th
Pretoria, Arcadia ...	86·5	58·0	72·2	95·9 " 15th	51·0 " 2nd
Standerton	81·7	55·3	68·5	91·0 " 20th	46·0 " 2nd
Zeerust	89·9	60·5	75·2	100·9 " 20th	49·2 " 13th

An unusually warm January, resembling somewhat that of 1906. At Pretoria the maximum of the month was 95·9 degrees as against 86·8 degrees in January, 1907. The range of temperature was larger than usual.

Rainfall Return for January, 1908.

(Including Rainfall since 1st July last and the corresponding averages.)

Note.—The rainy season is measured from 1st July in one year to the 30th June in the next.

District.	Place.	Month. Jan., 1908. Ins.	Days.	Season. From 1st July, 1907. Ins.	Days.	Averages. Month. Ins.	Days.	Season. Ins.	Days.
Barberton ...	Barberton	3·55	11	13·30	54	3·70	9	15·32	39
	Komati Poort	0·71	6	7·09	32	3·09	9	15·96	40
Bethal ...	Bethal	4·63	15	19·89	60	4·67	12	15·54	47
Bloemhof ...	Bloemhof	1·81	7	11·97	42	4·46	12	10·64	38
Carolina ...	Carolina	4·66	14	18·74	48	5·83	—	19·56	—
Ermelo ...	Ermelo	6·30	18	19·38	57	5·27	16	20·28	65
	De Hoop	7·62	18	26·66	80	6·19	15	—	—
Heidelberg ...	Vereeniging	2·01	11	15·79	52	4·02	12	13·21	48
	Heidelberg	1·62	12	16·06	55	4·53	12	16·54	46
Lydenburg ...	Pilgrims Rest	4·93	13	17·70	67	6·13	19	18·02	72
	Belfast	8·51	18	—	—	6·72	16	21·73	68
Marico ...	Zeerust	3·52	14	14·69	40	3·41	13	9·41	48
Middelburg ...	Middelburg	2·65	17	17·56	57	5·13	17	18·14	56
Potchefstroom	Potchefstroom	4·44	12	15·20	46	4·62	11	14·03	44
	Klerksdorp	3·54	16	11·28	55	3·82	16	11·80	48
Pretoria ...	Govt. Buildings, Pretoria	1·55	10	14·62	47	4·23	15	13·86	46
	Arcadia, "	2·91	13	16·33	54	5·26	16	16·52	52
	Modderfontein	2·31	10	13·50	49	4·49	16	15·88	53
Rustenburg ...	Rustenburg	2·33	10	—	—	4·26	14	—	—
Standerton ...	Beginsel Stud Farm ...	6·89	16	25·89	55	5·41	11	—	—
Swaziland ...	Mbabane	7·47	20	31·42	85	6·08	15	22·69	69
Wakkerstroom	Volksrust	4·18	17	21·07	65	6·43	14	19·62	55
	Wakkerstroom	6·55	14	21·57	47	6·51	7	19·45	49
Waterberg ...	Nylstroom	5·97	14	14·20	42	5·04	14	14·66	43
	Potgietersrust	4·12	12	13·54	42	6·01	11	17·59	37
Witwatersrand	Krugersdorp	4·54	14	15·98	56	3·81	17	14·67	55
	Joubert Park, J'burg ...	3·27	17	18·43	63	4·75	15	18·92	58
	Govt. Observatory, J'burg	2·08	15	16·33	60	4·77	16	16·56	53
Wolmaransstad	Wolmaransstad	2·78	9	11·89	46	4·20	14	10·12	37
Zoutpansberg	Pietersburg	2·53	14	10·15	35	3·48	9	12·61	35
	Leydsdorp	3·87	10	11·15	19	—	—	—	—

Summary.—The January rainfall was up to average in the S.E. of the Transvaal; elsewhere it was deficient, and many complaints of drought are heard. In Pretoria the amount was less than half the average. A few heavy thunder-showers occurred, but their areas were too small to have any useful effect on rivers. The season's total is just about the average of previous seasons, but this is owing to the good early rains.

PRETORIA AND JOHANNESBURG PRODUCE MARKET PRICES.

(Supplied by the Commercial Agency Co., Limited, Seed and Produce Merchants, No. 116, Vermeulen Street, Telephone No. 165, Box 784, Pretoria; and by Messrs. Hubert Morisse & Co., Produce Merchants and Commission Agents, Loveday and Frederick Streets, Box 68, Johannesburg.)

PRETORIA.

Description.	*December*, 1907.		*January*, 1908.		*February*, 1908.	
	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
White Mealies	0 8 6	0 10 0	0 8 9	0 9 9	0 9 0	0 11 6
Yellow Mealies	0 8 9	0 10 0	0 8 6	0 10 6	0 9 3	0 10 6
Bran, per 100 lbs.	0 6 0	0 8 0	0 5 6	0 7 3	0 6 3	0 7 9
Barley, per 150 lbs. ...	0 9 0	0 10 0	0 9 3	0 10 6	0 5 0	—
Kaffir Corn, per 203 lbs. ...	0 10 6	0 14 0	0 13 0	0 15 0	0 10 0	0 14 0
Wheat, per 203 lbs. ...	1 0 0	1 5 0	0 19 0	1 3 0	0 14 0	1 4 9
Forage, 100 bundles (Best)	0 9 6	0 15 0	0 10 0	0 13 6	0 10 0	0 16 0
,, .. (2nd quality)	0 4 6	0 9 0	0 6 0	0 10 0	0 3 9	0 10 6
Hay, per bale	0 0 6	0 1 6	0 0 4	0 1 0	0 0 3	0 0 10
Onions, per bag of 123 lbs.	0 12 6	0 15 0	0 7 0	0 9 6	0 5 9	0 10 0
Boer Meal, per 203 lbs. ...	1 7 6	1 11 6	1 2 6	1 7 6	1 1 0	1 7 0
Potatoes (best), per bag of 163 lbs.	0 8 0	0 12 6	0 8 0	0 16 6	0 6 6	0 14 0
,, (second quality), per bag of 163 lbs. ...	0 5 0	0 9 0	0 3 6	0 11 6	0 4 0	0 10 6
Chaff, per bale (pressed) ...	0 1 0	0 2 3	0 0 6	0 1 6	0 0 9	0 1 3
,, per bale	0 2 6	0 4 6	0 3 6	—	0 2 6	—
Eggs, per doz. (Local) ...	0 1 3	0 2 0	0 1 9	0 2 9	0 2 2	0 2 9
,, (Colonial) ...	0 1 1	0 1 9	0 1 3	0 2 0	0 1 3	0 2 0
Ducks, each	0 2 3	0 4 0	0 2 0	0 3 0	0 1 10	0 2 3
Fowls, each	0 1 3	0 3 6	0 1 4	0 2 9	0 1 2	0 2 9
Turkeys, each	0 6 9	0 17 0	0 5 9	0 12 6	0 3 6	0 13 6
Tobacco, per roll	0 0 3	0 0 9	0 0 4	0 0 9	0 0 6	0 1 0
,, cut, per lb. ...	0 0 3	0 0 6	—	—	0 0 4	—
Green Lucerne and Barley per doz. bundles ...	0 0 3	0 1 0	0 0 4	0 1 0	0 0 6	0 1 0
Wood, per load	1 0 0	4 8 0	0 10 0	2 0 0	0 8 6	2 0 0
Oranges, per 100	0 5 6	0 8 6	—	—	—	—
Lemons ,, ,, ...	0 1 6	0 3 0	—	—	—	—
Butter, per lb.	0 1 1	0 1 6	0 0 9	0 1 6	0 0 9	0 1 6
Oats	0 10 0	0 12 6	0 8 9	0 10 3	0 8 0	0 11 9

JOHANNESBURG.

Description.	*December*, 1907.		*January*, 1908.		*February*, 1908.	
	Lowest.	Highest.	Lowest.	Highest.	Lowest.	Highest.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Barley, per 163 lbs. ...	0 7 6	0 11 6	0 6 0	0 9 6	0 7 6	0 11 6
Bran, per 100 lbs. (Colonial)	0 6 3	0 7 0	0 6 3	0 7 3	0 6 3	0 6 9
Chaff, best, per 100 lbs. ...	0 2 6	0 3 3	0 2 6	0 3 9	0 1 6	0 3 0
„ medium „ ...	0 1 6	0 2 0	0 1 6	0 2 0	0 1 0	0 1 6
Eggs, per doz. (Colonial) ...	0 0 11	0 1 4	0 1 2	0 1 7	0 1 5	0 1 10
Salt, per bag	0 5 6	0 6 0	0 6 0	0 6 3	0 6 0	0 6 3
Forage (Transvaal) ...	0 4 6	0 5 6	0 3 9	0 5 3	0 3 3	0 5 0
„ (Colonial) best, 100lbs	0 5 9	0 6 3	0 5 3	0 6 6	0 5 0	0 6 0
„ „ med. „	0 2 3	0 4 6	0 2 0	0 4 6	0 1 6	0 3 6
S. Meal, good	1 6 9	1 10 6	1 4 3	1 10 0	1 4 9	1 6 0
Rye	0 12 0	1 3 3	0 12 0	0 19 0	0 12 0	0 13 9
Wheat	1 0 6	1 4 9	0 16 6	1 1 6	0 14 9	0 18 6
Mealies, Hickory King Whites	0 8 0	0 8 6	0 7 9	0 8 6	0 8 6	0 9 0
„ (O.R.C.), Whites ...	0 8 0	0 8 3	0 7 9	0 8 3	0 8 3	0 8 9
„ Yellow	0 7 9	0 8 3	0 7 9	0 8 3	0 8 9	0 9 3
Kaffir Corn, per 203 lbs ...	0 13 9	0 15 6	0 12 6	0 14 3	0 13 0	0 15 0
Hay, sweet (Transvaal) ...	0 1 0	0 1 9	—	—	—	—
Lucerne, per 100 lbs. ...	0 3 6	0 6 0	0 2 6	0 4 9	0 2 6	0 5 0
Manna	0 2 6	0 4 0	0 2 0	0 4 0	0 2 0	0 3 3
Transvaal Hay	0 0 8	0 1 4	0 0 3	0 0 7	0 0 4	0 0 7
Oats, per 150 lbs.	0 6 9	0 12 0	0 6 6	0 11 6	0 6 6	0 10 6
Potatoes, best, per 153 lbs.	0 8 0	0 13 0	0 6 0	0 16 0	0 9 0	0 15 0
„ med. „ ...	0 6 6	0 11 0	0 4 0	0 12 6	0 5 0	0 10 6
„ inferior „ ...	0 3 0	0 8 6	0 2 0	0 7 6	0 3 0	0 6 0
Onions, new, per 120 lbs. ...	0 9 6	1 0 0	0 6 6	0 14 6	0 3 9	0 10 6
Pigs, live weight, per lb. ...	0 0 3	0 0 3½	0 0 3	0 0 3½	0 0 3	0 0 3½
Turkeys, cocks	0 8 6	0 16 0	0 7 0	0 15 0	0 8 0	0 14 6
„ hens	0 4 6	0 8 0	0 3 6	0 6 0	0 3 9	0 4 6
Fowls	0 1 6	0 3 6	0 1 3	0 3 0	0 1 2	0 2 9
Ducks	0 2 0	0 4 3	0 1 5	0 2 9	0 1 6	0 2 3
Geese	0 4 0	0 6 0	0 3 3	0 5 0	0 4 0	0 5 6
Pigeons	0 0 9	0 0 10	0 0 9	0 1 0	0 0 9	0 0 10
Bedding, per bale	0 0 6	0 1 0	—	—	—	—
Grass, per bale	0 1 0	0 1 2	—	—	—	—
Butter (O.R.C.), per lb. ...	0 0 10	0 1 2	0 0 7	0 1 2	0 0 8	0 1 0
Pumpkins, each	0 0 6	0 0 9	0 0 3	0 0 9	0 0 3	0 0 6
Beans, sound, per 200 lbs...	0 15 0	1 10 0	0 15 0	2 10 0	1 0 0	1 18 6

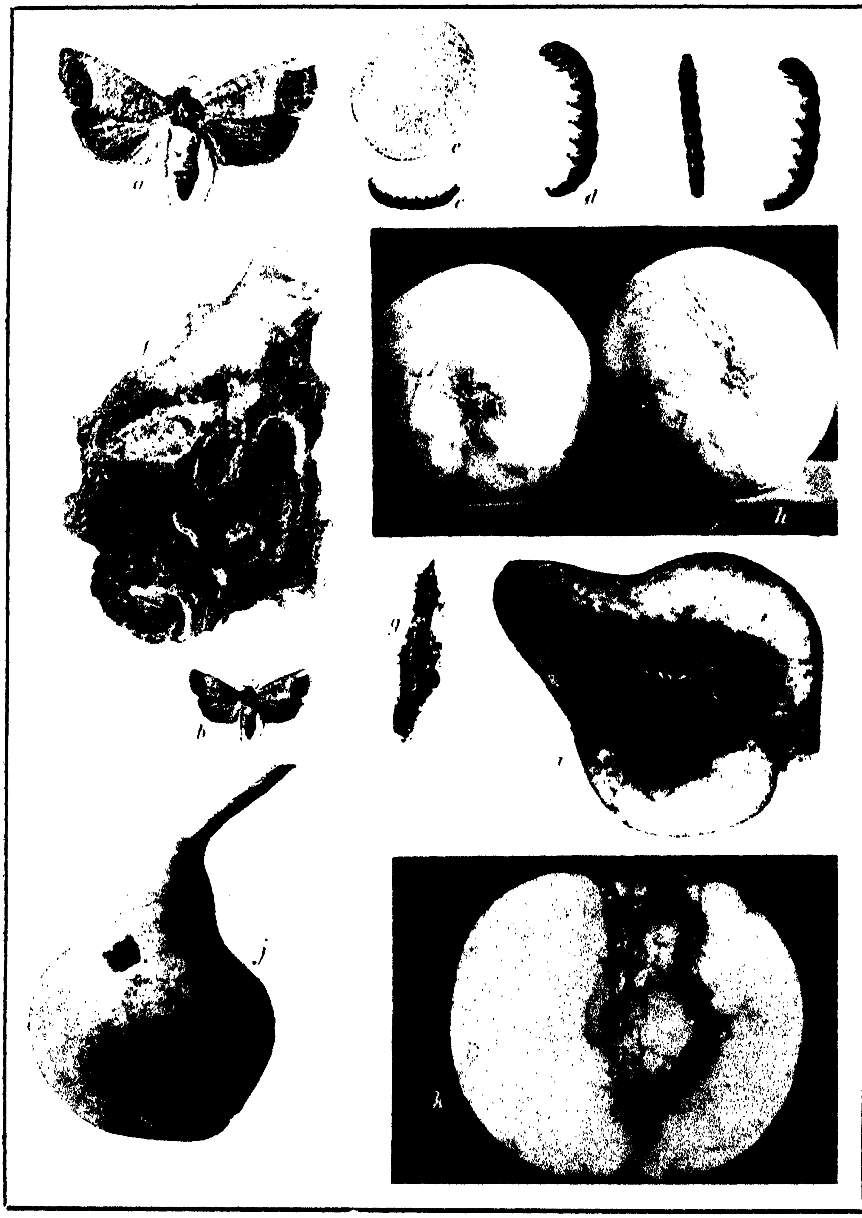

Plate 62.

The Codling Moth.

(*Carpocapsa pomonella.*)

a. Moth—enlarged.
b. Moth—natural size.
c. Maggot—natural size.
d. Maggots taken from pears—enlarged.

e. Egg—much enlarged (from Slingerland).
f. Cocoons on piece of bark.
g. Pupa in cocoon.
h. Infested apples showing exit holes at calix.

i. Section of pear, infested by Codling Moth larva.
j. Pear showing exit hole.
k. Section of apple showing burrows made by worms.

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THE CODLING MOTH.

(*Carpocapsa pomonella, Linn.*)

By C. W. HOWARD, B.A., F.E.S., Government Entomologist.

There is probably no insect pest which has caused more loss to the fruit grower than that cosmopolitan one, the codling moth. It has been a pest for many generations. As far back as the first century of the Christian era it was known, and Pliny refers to it in some of his writings. The original home was probably south-east Europe, from where it spread over the continent of Europe, and then to the other parts of the world, until now it is found in nearly every place where apples and pears are grown. At present we find it, besides Europe, in Siberia, Canada, United States of America, Australia, Tasmania, New Zealand, South Africa and Brazil. In countries where nothing has been done to control this pest, the loss to apples varies from 25 per cent. to 100 per cent. of the crop, while it is usually less for pears. In New York State, which is only a small portion of the apple and pear-producing region of the United States of America, it is estimated that the codling moth destroys £600,000 worth of apples and pears each year. Of course the loss would vary with the size and value of the apple crop each year, but a conservative estimate of the average value of apples destroyed by codling moth each year in the United States of America is about £2,280,000. (Plate 62.)

No doubt every one is familiar with the wormy apples which formerly entered the Transvaal from Cape Colony and oversea. These worms when full grown are about ⅝ of an inch long, and of a pinkish and creamy white colour. When full grown, the larva eats a tunnel to the surface of the apple, covering the opening with silk and frass. When ready to emerge, this filling is pushed out, and the larva crawls forth and searches for a suitable place in which to spin the cocoon, such as holes or cracks in trunks or branches of the trees, under rough bark, under clods, among fallen fruit, or in any protected places.

After about six days the caterpiller transforms to a pupa, which changes from a yellowish colour to a dark brown, and later to a bronzy hue. In about twenty days, after the spinning of the cocoon, the pupa pushes its way out, the skin splits, and the moth emerges. The adult moth is seldom seen. It is of a small size, being only ¾ of an inch at the maximum across its spread wings, the front wings are of a brownish grey colour, crossed with irregular grey lines, giving them the watery

appearance often seen in silk fabrics. At the tip is a large brownish spot with several gold and bronze lines. The hind wings are greyish brown in colour. The colouration of the moth as a whole is such that, when resting on a tree, it is distinguished from the bark only with difficulty.

A few days after emergence the moth lays her eggs on the leaves or fruit of apples, or other food plants. The majority of the eggs of the first generation are laid on the leaves and on the calyx end of the young apples, those of the second generation mostly on the fruit. The egg is a very minute, flat, scale-like structure, of a pearly-white colour. In about eleven days the young caterpillars break their way out of the eggs. When they have been laid upon the leaves, the larvae usually make their first meal on the leaf before finding the fruit. The hard, smooth skin of the apple furnishes some difficulty to the young worm in entering, so they usually take advantage of the calyx or some irregularity in the surface of the fruit. About 80 per cent. of the first generation enter through the sides, especially at points where fruits are touching, or where leaves cover them. At first the larva feeds at the surface, then it begins to tunnel towards the centre, where it excavates a large cavity, filling it with excrement. The moth spends the winter in the larval stage, encased in silken cocoons, in cracks and holes in the trees or other convenient shelters. In the spring these larvae transform to pupae, from which the moth emerges about a week after the apple is in flower.

In the above account of the life history of this insect, I have mentioned first and second generations. In cold, temperate regions, like Canada and the Northern United States, there is usually only one generation in a season, with a tendency towards a second. In warmer regions we find two, with a tendency towards a third. Where two generations occur, the second does far more damage than the first.

The codling moth attacks several fruits besides apples, although this is its natural food. Pears are next in the order of preference, although if apples are few in numbers, pears suffer severely. The same statement applies to quinces. Usually they are only slightly infested, if at all, but if apples and pears are scarce, they may be badly attacked. Besides these fruits, they have been noticed very occasionally in plum, peach, and cherry, but never in sufficient numbers to cause any injury.

The spread of the codling moth is probably due principally to the great development of commercial intercourse during the last century, as the worm is often still in the fruit when it is packed, and finds in packing cases a suitable place to spin its cocoons and undergo its transformation. It is quite possible for it to be carried long distances. When the fruit is unpacked at its destination, the boxes are usually thrown to one side, without a thought that inside there may be anywhere from one to a hundred little worms, ready to transform to moths when the proper season comes and start their progeny in the first suitable place. It was undoubtedly in this way that it was carried from Europe to the other continents, and from one portion of a continent to another, and so, probably, came first to South Africa. Locally it spreads by the moth flying from place to place.

At present the codling moth is very plentiful in the apple-growing regions of Cape Colony. It seems to have been noticed in the Cape in 1885. It was found to be abundant in Graaff-Reinet in 1892, which seems to have been the chief centre of infection for the Western Province. While

the moth was still confined to a few isolated localities, repeated warnings of the dangerous nature of this pest were issued by officials of the Cape Agricultural Department and others interested in horticulture at the Cape. No heed, however, was given to the warnings, with the result that codling moth is now spread over a large area of Cape Colony, and may be considered as one of its worst insect pests.

* * * *

This article is intended as a warning to fruit growers in the Transvaal. At present we have practically no codling moth in the Colony, and every effort is being exercised by the Agricultural Department to exclude it. All apples and pears are examined carefully upon entering the Transvaal, and if one percentage of fruit bears indications of the presence of codling moth larvae, the whole consignment is destroyed, including cases and packing. No distinction is made between fruit produced in South Africa and that brought in from oversea. The result is that many consignments of apples and pears are destroyed by us each week. Recently, however, we have found codling moth present in one small isolated locality in the Transvaal, *i.e.*, the town of Middelburg.

Strangely enough, it is present only in the town itself, and apparently has not yet spread beyond its limits. The wormy apples and pears have been noticed by the inhabitants of Middelburg for some years without realizing the dangerous enemy which they were harbouring. Another strange fact in connection with the codling moth at this place is that it seems to attack the quince quite as readily as either apple or pear. The codling moth was probably introduced to Middelburg some years ago in infested apples or pears, brought in from oversea or from infected parts of South Africa. If allowed to go on unchecked, there is no doubt but that it will spread from thence, and finally invade the whole of the apple-growing area of the Transvaal. That enterprise is still in its infancy, and if this pest secures a firm foothold, its future will be seriously hampered.

The matter has been brought to the attention of the inhabitants of Middelburg during the last few weeks, and it is a pleasure to record that they have fully realised the seriousness of this pest, and have loyally offered to do everything in their power to wipe it out. They have agreed to destroy all apples, pears, and quinces remaining on the trees this year, and to destroy the whole crop during the next season, and the following if necessary. This method has worked successfully on several occasions in other countries, and we hope it will be the same in this case.

Ever since the Entomological Department was established in the Transvaal, a careful watch has been kept for codling moth. So far, Middelburg is the only place where it has been found, and the measures for extermination which have been adopted there, together with the careful inspection of fruit carried out by the Agricultural Department, should put off for many years to come the sad day when our apple growers will have to adopt the expensive processes carried out in other countries for the control of this pest. Thousands of pounds sterling are expended each year in Canada, United States, New Zealand and Australia in the destruction of the codling moth. A few words describing these methods may be of interest.

Spraying.

Nearly thirty years ago it was discovered that arsenical sprays were of value against the codling moth. To be most effective, the spray must

be applied just after the flowers have fallen, but before the calyx lobes have closed up. Enough of the poison is caught up between these open lobes, which afterwards close over and prevent the rains from washing it away. Afterwards the newly-hatched worm, which usually enters the fruit at the blossom end, comes along and makes his first meal on the poison enclosed in the calyx. Two sprays are generally recommended; one just after the flowers fall, and another two weeks to a month later. In cases of bad infection, a third spraying may be necessary.

Paris green is the commonest arsenical powder employed, and is used in the proportion of one pound to 160 gallons of water. Of late, however, arsenate of lead is being extensively used in its place. As several fungoid diseases attack apples, the Paris green is frequently mixed with Bordeaux mixture, and the two applied at one time. This has the advantage that the lime in the Bordeaux mixture counteracts the soluble arsenic in the Paris green. When used without Bordeaux, two or three pounds of freshly-slaked stone lime must be added to the spray for each pound of Paris green.

BANDING.

Before the use of arsenical sprays, banding was the only remedy of any value. Cloth bands of sacking, 10 to 12 inches in width, are folded once lengthwise and wrapped around the tree. They are fastened in such a way as to be easily removed and replaced. If the tree is large, one band is placed round the trunk and one on each of the larger limbs. These bands provide protected places under which the larvae crawl to spin their cocoons after they leave the fruit. It is important that the bands be watched carefully and no moths allowed to develop. They should be removed once every ten days, and all cocoons destroyed. At best, this method can be of but little benefit where the infection is very bad, but it is a valuable adjunct to other remedies.

LOCUSTS BIRDS.

By Dr. J. W. Gunning, Director of the Transvaal Museum.

As numerous letters are being received asking for a more detailed description of the locusts birds and the other birds protected by law, it was thought advisable to give a short review of the habits of these birds in the pages of the *Agricultural Journal.*

There is a good deal of misunderstanding about the protection of game birds, many people being under the impression that they are protected on account of their insect destroying diet. This is not the case; these birds are simply protected during certain months of the year—namely in the close season—in order to prevent their extermination by the gun of the hunter.

A different matter altogether is the case of birds mentioned in the *Government Gazette* No. 360, of 8th December, 1905. These are a few of the birds that wage a more or less constant warfare against the locusts, and are therefore protected all the year round. The list of the protected birds might conveniently be extended to include the Lesser or Nauman's kestrel and the common buzzard, as on opening the crops of many of these birds they have been found to contain almost exclusively remnants of locusts; in fact I have repeatedly observed large swarms of locusts which were followed by hundreds of birds which were first taken to be the ordinary small locust bird (*Glareola pratincola*), but which under observation of a field-glass proved to be nothing else than a flock of Nauman's kestrel (*Cerchneis naumanni*).

The jays, lately added to the list of protected birds, doubtless destroy numbers of locusts, and ought therefore to be protected; they are killed principally for their handsome plumage, and a large demand has been created for their skins for the purpose of ornamenting ladies' hats.

The buff-backed egret, although destroying a good few locusts, owes its inclusion in the list to its predilection of searching for the ticks which are found on bovine animals (hence its vernacular name of "tickbird"), and will only interest us later on. The real locust destroyers are the pratincoles, the storks, and the wattled starling; we will give descriptions of each species so as to enable the farmer to distinguish his friends as easily as possible.

* * * *

The pratincoles are well known as the ordinary sprinkhaan vogels. They belong to the family *Charadriidae*, a family which includes the coursers, the kievietjes, the plovers and the dikkops. The sprinkhaan vogels are rather shorter in the legs than the most of their cousins, but anatomically they have great resemblance to the other members of the group.

In South Africa we have only to deal with two kinds of pratincoles, the ordinary blackwinged or Nordman's sprinkhaan vogel, and the pratincole with a chestnut colour under the wing coverts. They are coursers with a hind toe; the bill is short, hardly half the length of the head, and slightly curved; the tarsus (generally understood by the "leg") is as long as or longer than the middle toe, and is covered in front with

square scales; there is a web between the middle and other toe; the tail is deeply forked; they are coloured olive-brown above, the breast is sand coloured, the under wing coverts are reddish brown to brownish black, the first wing feather has a white shaft, eye brown, bill black. Every farmer knows the kleine sprinkhaan vogel. Little is known about their extensive wanderings, but in the month of October they frequent the steppe country round Kordovan and Sennaar. Sclater, in his "Fauna of South Africa," says :—"The bird, together with the wattled starling, are all known as locusts birds in South Africa, and are much appreciated for the great assistance they afford the farmer in helping to destroy the devastating swarms of locusts which ravage the country from time to time." They are generally, though by no means invariably, found in large flocks following the swarms; they have a bold swallow-like flight, and catch their prey in the air, and they also run on the ground like plovers and pick up "voetgangers" or young locusts which are still without wings. When attacking a swarm they separate out a certain portion, and flying in an ever widening ring destroy all the enclosed insects by snapping off their wings and devouring them whole. The description covers both kinds, with the exception of the underwing feather as stated above. Their scientific names are *Glareola fusca* (L.) and *Glareola melanoptera* (Nordm.).

The large locust birds belong to the family *Ciconiidae, ooievaars*. The principal locust destroyers of this family are the white stork, witte or groote sprinkhaan vogel (*Ciconia ciconia*, L.); the black stork, zwart ooievaar or sprinkhaan vogel (*Ciconia nigra*, L.), andl the white bellied stork, witpens sprinkhaan vogel (*Abdimia abdimi*, Licht).

The white stork inhabits Europe (with the exception of the most northern countries), West Asia, and North Africa, and wanders during the European winter months to Africa and India. In Africa it has been found as far south as Capetown and Port Elizabeth, but on account of its habit of following the swarms of locusts its wanderings are very irregular. The general colour above and below is white, the wings black, with a slight greenish or purplish glow, bill dark red, legs and feet reddish pink. It attains a length of about 46 inches, measured from tip of bill to end of tail. It cannot be said with certainty whether the bird breeds here or not; several observers mention that they have been told so, but no authentic dates are available. The bird does not fly among the locust swarms like the pratincole, but I have often observed that the bird only arrives at the place where the swarms settle for the night, has a good feed in the evening and morning, remains in the locality where it has been feeding long after the swarm has risen for the day, and then follows in the direction that the swarm has taken, and arrives again amongst it after the locusts have settled for the night.

It would be of very great interest if the readers of this *Journal* would keep a record of the dates when these birds have been observed and in what localities, and send their observations on a post-card to the Director of the Museum, Pretoria, so that the question can be solved whether any individuals really remain here during the South African winter.

The black stork (*Ciconia nigra*) has a much larger range of distribution, as it occurs even in Mongolia and Northern China; in South Africa it is decidedly rarer than the white one. Above it is dark brown to black, with a metallic copper and green gloss; below, from the chest downward, white; bill and feet coral red. It is not known to breed in South

Africa, but visits us only during our summer months. Its habits are very much the same as those of its white cousin, although it is never found in such large flocks. It attains a length of about 46 inches.

The third species of stork that interests us here is the white bellied stork (*Abdimia abdimi*, Licht), which is much smaller than the two previous described species. It only attains a length of about 30 inches. The general colour above is black, with a green and purple gloss. The black rump and upper tail coverts are white; the under side is white; there is bare skin round the ears and in front of the eyes, and the throat is crimson; the legs are dull olive, with crimson feet and knees. It is not known to breed in South Africa.

* * * *

Another bird protected by law in South Africa on account of its locust fighting habits is the wattled starling or *Perrisornis carunculatus* (Gm.). It is simply called locust bird by the English colonists, whereas the Dutch have no general name for it. It is, however, sometimes called the "lelspreeuw," on account of the large "lel" or wattle which the male develops in the breeding plumage. The size and shape of these wattles vary very much, either individually or locally, or perhaps according to the age of the bird, as many male specimens have been received in the height of the breeding season whose wattles have been very small indeed. This bird belongs to the family of starlings (*Sturnidae*), all the members of which feed largely on insects and wild fruit; a few species become exceedingly troublesome in fig plantations when the luscious fruit is ripening. The entire bird is of a drab colour, with black wing and tail feathers; the head and face are bare of feathers in the male in the breeding season. The bird is barely 8¾ inches long. It is not a migratory bird in the usual sense of the word, as their wanderings do not seem to take place at certain seasons. Sclater, in his "Fauna of South Africa," gives the following splendid description of their habits:—

"When pursuing a flight of mature locusts these starlings perform various extraordinary and beautiful aerial evolutions with the object of intercepting and surrounding a portion of the swarm, and in doing this their movements closely resemble those of another locust-destroying starling, the beautiful rose-coloured pastor of Eastern Europe and Asia. Individually the two species are very different, collectively and under similar conditions their actions are quite similar. Starting in a dense 'ball-like' mass, they suddenly open out into a fan-shaped formation, then assume a semi-circular arrangement, and finally end by forming a hollow cylinder in which a portion of the locusts is enclosed; as the imprisoned insects are destroyed, the starlings gradually fill up the hollow of the cylinder until they again assume their 'ball' formation and proceed to follow the remaining locusts. The ground below the flock is covered with the droppings of the birds and the snipped off legs and wings of locusts. At other times the starlings station themselves on the tops of bushes and trees, from which they dart on the flying insects like flycatchers. When feeding on the ground on the young locusts they advance in long lines, three or four deep, the rearmost birds constantly jumping over those in front of them like English starlings. When locusts are not to be had the wattled starling will eat almost any variety of insect food, but seems to prefer grasshoppers and small beetles; occasionally they feed on berries and seeds."

These birds breed in large colonies near to the localities where swarms of locusts have deposited their eggs.

The buff-backed egret or boschluis vogel (tickbird) mentioned above belongs to the family of herons, several of which do a considerable amount of damage to pisciculture. Our tickbird, however, is very useful in picking off numberless ticks from cattle, thereby aiding greatly the prevention of stock diseases, which are carried from sick to healthy animals by ticks. It is also a good locust destroyer. It is a gregarious bird, as it is usually found in flocks, where cattle or, in the wilder parts of the country, where buffaloes and the like are grazing. The plumage is entirely white, except for the decomposed, elongated, ornamental plumes covering the head and nape, centre of the back, and the fore-neck, which are pinkish buff. The bill is yellow, as well as the skin round the eye. The tickbird is found over the whole of Africa, and is nowhere rare where sufficient water and vleis are to be found. It breeds in most suitable localities. The bird attains a length of about 20-21 inches.

The abovementioned birds are the only ones officially protected by law on account of their useful habits. This does not say that scores of other birds have not the same claim to protection at the hands of the farmer. It is most regrettable that so little trouble is taken in schools to impart some general knowledge about the habits of our feathered friends in this country, especially to those children who come from the country districts, and who later on return there; as most frequently they are quite ignorant as to which birds are their friends and which their enemies. It would be most desirable if the Government caused large pictures to be published and to have them put up in every school; not only of birds that are officially protected, but also of the scores of useful or harmful birds, mammals, reptiles, and insects which play such an important part in the agricultural economy of this country. A useful and well illustrated book, entitled "Sketches of Bird Life in South Africa," has just appeared from the pen of Messrs. Haagner and Ivy, which will doubtless spread a good deal of information on the subject of bird-life in our Colony, and which ought to rouse more interest in our feathered friends.

NOTES ON COTTON CULTURE.

By Walter H. Charter.

Cotton can be cultivated with more or less success on nearly all kinds of soils within a region in which the climatic conditions are favourable to its growth and development. Light sandy soils, loams, heavy clay soils and alluvial river lands will all grow cotton, but not with equal success. On sandy lands the yield of cotton is usually small; on clayey lands, more particularly during a wet season, the plants attain a large size, but do not yield such a proportion of lint as their size would appear to justify; this applies equally to river lands. The safest soils for the crop are medium grades of loam.

The soil must be considered from two points of view: First, as to its capacity for supplying food to the plant, and, secondly, its physical condition, more especially as to heat and moisture.

Every farmer recognises when he puts in his crop the great uncertainty as to the probable yield, and it is no uncommon thing for the yield of cotton for an entire district to be double one year what it was the previous year. It is likewise a common experience that the cotton in one field will be much more affected by unfavourable climatic condition than that in an adjacent field of perhaps a different sort of soil. Different types of soil maintain very different conditions of moisture for the plants, and therefore the relative amount of moisture in different soils depends upon the amount of space in the soil for the water to enter, upon the number of grains of sand, silt, and clay.

Soils contain, as a rule, about 50 per cent. by volume of empty space into which water and air can enter. In a sandy soil this space will not be divided up so much as in a clay soil, and the sand having fewer grains, naturally the spaces between the grains are larger: there is therefore less to impede the water, which moves down more quickly.

Excessively sandy soils will not, therefore, retain so much moisture for the plants. The particles of clay soils, on the other hand, are so exceedingly minute, and there are such a vast number of them in the soil, that the spaces between them are very small and offer a great resistance to the descent of moisture, so that the water moves very slowly, and a large amount is maintained for the plants. A strong clay soil will usually contain three or four times as much water as a sandy soil, and this has a very important effect upon the growth of cotton, for there is a danger during a wet season of a clay soil remaining too moist, but this can be easily obviated by ploughing a few drainage furrows through the lands.

A cotton soil should maintain uniform conditions of moisture, for any marked or sudden variation, especially during the growing period, is apt to affect the plants and have a serious effect upon the development of the crop.

During the early growing season of the plant, up to the end of February, the soil should be continuously moist, but not too wet. A sandy soil, as a rule, is not sufficiently retentive of moisture, and therefore the supply of moisture is so inadequate that the plants are small and are

forced to an early maturity before they have gathered sufficient food material for a normal crop. On the other hand, a clay soil is liable to retain too much moisture, and the plant takes on an excessive growth. If this condition is checked at the proper time and the plant is induced to mature fruit, the yield may be large, but if this condition continues and the soil remains continuously moist after the end of February the plants develop in a luxuriant way, but with little tendency to put on fruit. From the foregoing it will be seen that the best soil for cotton culture is a deep loam, naturally well drained, but sufficiently retentive of moisture to maintain a uniform supply throughout the growing season.

Climate.—The following are the essential features of a climate adapted to the cultivation of cotton :—

The season must be sufficiently long for the crop to mature. One of the most important factors is, therefore, the probable date of the last frost in the spring or planting season and the earliest frost in the autumn or harvesting season, for cotton has a long growing period.

Cotton picking can be extended into early winter, but the first autumn frost checks the active growth of the plant, and their blossoms or young bolls which start at that time will not develop into mature fruit. About six or six and a half months of favourable growing weather is required for the proper development of the cotton plant. Districts with late spring rains are, therefore, not the best for this crop, unless it is grown under irrigation.

The maximum mean temperature for the months of November to June on the Tzaneen Estate, extending over a period of four years, are as follows :—

November	83° Fahr.
December	83° „
January	83° „
February	81° „
March	80° „
April	79° „
May	77° „
June	75° „

From these figures it will be seen that the highest and practically even temperatures are during the first three months after planting, during which period the cotton plant should have attained its maximum growth, and the following months, with a slight downward graduated temperature should be very favourable for the flowering and maturing of the bolls.

Deep ploughing is essential for the cotton plant, and in order to withstand two weeks' drought during the growing season the depth of soil must not be less than 10 or 12 inches.

The seed should be planted in rows from 3 feet 6 inches to 4 feet apart, and three or four seeds dropped about every two feet in the rows. When the seedlings are about 4 or 5 inches high they should be thinned out, leaving only two. It is important that this thinning process should be done immediately after a rain, after which, when the remaining plants are 8 or 9 inches high, thin out again, leaving only one.

Blossom.—The plants should commence to blossom when about 18 inches high, and during this period a fair amount of moisture is necessary, extended over the period fairly regularly. The land must be kept constantly hoed and cultivated to prevent weeds choking the young plants. Too much rain at this period has a tendency to cause the plants to produce a number of surface roots or a too rapid development of the stalk and limbs to the detriment of the bloom and fruit.

The bloom of the cotton plant opens during the early morning and remains open to the sun until late in the afternoon ; the petals then close until the following morning, when they open again. The colour of the flower undergoes a change from a delicate creamy yellow to a light red, and when the petals fall off a boll is left.

It is now that but little rain and plenty of sunshine are needed—continuous dull weather at this stage being almost as disastrous as constant rain. If too much rain falls, the weeds begin to grow rapidly, to the detriment of the fruit ; the plant will cease to make new blooms, and the buds already formed will drop off. The bolls will decay on account of the accumulated moisture which they absorb, and the fibre in the open bolls will be either beaten out or discoloured. Dry weather, without severe winds, is required for picking.

THE VETERINARY SECTION.

EXPERIMENTS WITH ENGLISH AND SOUTH AFRICAN REDWATER.

By Dr. Arnold Theiler, C.M.G., Government Veterinary Bacteriologist.

In order to overcome the mortality caused by ordinary redwater when exposing imported cattle on the South African veld, I decided to conduct some experiments in this connection, and was fortunate in obtaining the assistance of Mr. Stockman, Principal Veterinary Surgeon of England.

The experiments were performed with a three-fold object, namely, to test (1) whether English and South African redwater are identical; (2) if English cattle immunised against English redwater would thereby acquire any immunity against the ordinary redwater of South Africa; and (3) if English heifers inoculated in England with South African redwater would be immune against our disease when exposed to natural infection in South Africa.

Accordingly, six heifers were purchased on our behalf by Mr. Stockman, and were treated by him in England. One lot were injected with English redwater, the second batch with South African redwater (or, as it is commonly known, ordinary redwater), and the remaining two heifers with both English and South African redwater.

I am greatly indebted to Mr. Stockman for making careful examinations of these animals, and it is from his notes that the following particulars of temperatures and blood examinations have been obtained.

* * * *

Experiment No. 1.—*English Heifers injected with English Redwater.*

"A," *Heifer* 428.—Injected in England subcutaneously on the 25th July, 1906, with 5 c.c. defibrinated blood of a heifer (which had previously been inoculated with blood obtained from a natural case of redwater in Hampshire, but which did not react in any marked degree, and it is highly probable that she did not contract the infection).

Heifer 428 did not show any reaction, and all smears examined from the date of injection to the 1st September gave negative results.

On the 1st September, 1906, 428 received an injection of 10 c.c. defibrinated blood from an English cow which had recovered from a natural attack of English redwater. Temperature rose on the 8th day to 105° F. in the morning, and 106° in the evening, returning next day to normal. On the 24th day it reached 104.6° in the evening, but fell again to normal two days later.

Examinations of blood preparations from the 8th to 26th September gave negative results, and the blood count on the 4th October, 1906, showed the number of red cells to be between six millions and seven millions per c.m.m.

"*B*," *Heifer* 430.—Injected in England with 5 c.c. defibrinated blood of an English heifer (which had previously been inoculated with English redwater, but the injection probably failed to infect the beast).

430 did not show any reaction, and no piroplasms were found in the blood preparations.

On the 1st September 430 was inoculated subcutaneously with 10 c.c. defibrinated blood of an English cow which had recovered from a natural attack of English redwater.

Temperature of 430 rose to 102° on the 6th day, and to 104° in the evening of the 8th day. Smears examined on this latter date showed distinct but only small numbers of piroplasms (English redwater); the temperature now fluctuated between 102.6° and 105.2° for the next two days and regained normal on the 11th September.

Another, but slight, reaction ensued from the 23rd to the 28th September.

Experiment No. 2.—*English Heifers injected with South African Redwater.*

"*A*," *Heifer* 429.—Injected in England on the 1st September, 1906, with 5 c.c. defibrinated blood of an English heifer (which had been infested with the infected blue ticks I sent to Professor Sir J. McFadyean in 1905, and, as a result, developed South African redwater and recovered).

On the 9th day the temperature of 429 rose to 103°, but examination of smears were negative. On the 10th day temperature recorded 105.2 in the evening, and piroplasms (ordinary redwater) were found in the smears. The temperature fluctuated for the next four days, but returned to normal on the 15th September. Piroplasms (ordinary redwater) were again noted on the 11th day.

"*B*," *Heifer* 432.—Injected on the 1st September, 1906, with 5 c.c. defibrinated blood from the English beast which had been infected with blue ticks and contracted South African redwater.

Temperature of 432 rose to 103° on the 6th day, but examination of smears were negative; regained normal on the 7th to 9th days, but recorded 105° on the 10th day, when blood examinations were again negative. Piroplasms (ordinary redwater) were noted for the first time, and only on the following day. Temperature remained high for the next three days and regained normal on the 16th September.

Experiment No. 3.—*English Heifers injected with English and South African Redwater.*

"*A*," *Heifer No.* 431.—Injected on the 25th July in England with 5 c.c. blood from an English heifer (which had previously been inoculated with English redwater, but this injection apparently did not cause the beast to contract the disease).

The temperature of 431 remained normal, and all blood examinations gave negative results.

On the 1st September 431 was injected subcutaneously with 10 c.c. blood of an English cow which had recovered from a natural attack of English redwater.

Temperature rose to 104.2° in the morning of the 8th day, and to 106° in the evening. Blood examinations on this date were negative. Temperature remained high for the next two days, but returned to normal on the 10th September.

On the 24th September 431 was injected subcutaneously with 10 c.c. defibrinated blood of an English heifer (which had been infested with infected South African blue ticks, causing her to contract South African redwater).

431 showed a rise of temperature, consequent on this inoculation, to 105° in the evening of the 1st October, 1906 —the 7th day. Piroplasms (ordinary redwater) were noted in the blood on this date, and a high temperature was recorded for the next three days.

"*B,*" *Heifer* 433.—Injected in England on the 5th July subcutaneously with 5 c.c. defibrinated blood of an English beast (which had been inoculated with English redwater, but, apparently, did not contract the infection).

The temperature of 433 remained normal, and all blood examinations were negative.

On the 1st September, 1906, 433 was injected with 5 c.c. defibrinated blood of the English beast which had contracted South African redwater from the infestation of infected blue ticks. Temperature of 433 rose to 103° on the 6th day, but examinations of blood did not reveal any piroplasms (ordinary redwater). The temperature now fluctuated for the next four days, and no piroplasms (ordinary redwater) were seen until the 11th and 12th days, when the temperature regained normal.

A short secondary reaction noted from the 22nd day, lasting for a few days, but no piroplasms (ordinary redwater) were found.

On the 24th September 433 was injected with 10 c.c. defibrinated blood of a beast which had recovered from a natural attack of English redwater.

Ten days later 433 showed a slight reaction, and on this date and the following days piroplasms (English redwater) were present. Temperature regained normal on the 6th October.

Notes on Heifers 428 *and* 430.

From Mr. Stockman's notes on the behaviour of heifer 428 in England, I am not inclined to consider it as immune against English redwater in view of the atypical reaction and the absence of piroplasms (English redwater).

Heifer 430 undoubtedly underwent an English redwater reaction, and should, therefore, be immune against this disease.

Notes on Heifers 429 and 432.

The injection of English heifers with a strain of virus originating from infected blue ticks sent from the Transvaal, and passing through an English beast caused, in both instances, the appearance of piroplasms (ordinary redwater), accompanied with a typical South African redwater reaction. Therefore, these two heifers should be immune against South African redwater.

Notes on Heifers 431 and 433.

The injection of English redwater into heifer 431 did not cause the appearance of piroplasms (English redwater), and the reaction was atypical. A subsequent injection of South African redwater caused the appearance of piroplasms (ordinary redwater) in the English heifer, together with a temperature reaction.

Heifer 433 was injected with South African redwater, in the first instance, and, as a result, showed piroplasms (ordinary redwater) accompanied with a temperature reaction.

Twenty-four days later it was injected with English redwater, and a slight reaction ensued, accompanied with piroplasms (English redwater).

Heifer 433 should, therefore, have acquired immunity against both English and South African redwater.

Conclusions.

It would be seen from these notes that, of four animals inoculated with English redwater, two failed to react or to show piroplasms (English redwater) and, in the other two instances, a reaction ensued, accompanied with the appearance of piroplasms (English redwater). Therefore, it is safe to say that English redwater is not always inoculable, and differs in this respect from South African redwater.

EXPERIMENT No. 4.—To note whether (1) South African animals, susceptible to ordinary redwater, contract English redwater when injected with blood from animals previously inoculated with this disease; and (2) whether these South African animals prove immune against ordinary redwater when injected with this disease (Piroplasma bigeminum).

(The South African animals used in this experiment were born and bred in Cape Colony in a district free of ordinary redwater, directly imported to the Transvaal, hence they were susceptible to the disease.)

Heifers Nos. 400, 418, 421 and 422 were all injected on the 13th December, 1906, with blood of English heifer 428. Heifer 428 (compare Experiment 1, "*A*") had shown a temperature reaction consequent on the inoculation with English redwater, but no piroplasms (English redwater) were noted in the blood.

These South African heifers were subsequently tested on their immunity against ordinary redwater by the injection of a strain of virus emanating from a natural case of ordinary redwater complicated with Piroplasma mutans (a form of gall-sickness of South African cattle).

"*A*," *Heifer* 400.—A two-year-old from Aliwal North, and susceptible to ordinary redwater. Injected on the 13th December, 1906, subcutaneously with 10 c.c. blood of heifer 428. As there were no results from this injection, heifer 400 was injected subcutaneously on the 3rd January, 1907, with 50 c.c. blood of heifer 428. Temperature remained quite normal, and, with the exception of blood changes (Poikilocytosis) on rare occasions, all blood examinations were negative.

Tested on immunity against ordinary redwater by the subcutaneous injection of 10 c.c. blood of heifer 425 containing Piroplasma bigeminum (ordinary redwater) on the 30th January, 1907. Reaction from the 5th day, reaching 104.6° four days later, and remaining high for the next three weeks. Blood changes (Poikilocytosis) and the lesions of Piroplasma mutans (a form of gall-sickness) appeared, but Piroplasma bigeminum (ordinary redwater) was not seen.

On the 26th April, 1907, 400 was injected with 10 c.c. blood of heifer 435, which was an imported English heifer, and had been rendered immune against ordinary redwater. This injection did not cause any temperature reaction in 400, nor did Piroplasma bigeminum (ordinary redwater) appear.

"*B*," *Heifer* 418.—Two-year-old heifer from Aliwal North and susceptible to South African redwater.

Injected on the 13th December, 1906, subcutaneously with 10 c.c. blood of heifer 428. No reaction; all blood examinations proved negative. Accordingly, on the 3rd January, 1907, heifer 418 was injected subcutaneously with 50 c.c. blood of heifer 428. The temperature remained quite normal, and no piroplasms (English redwater) were found in the blood smears. Spirillum (spirillosis-fever of cattle, and which may be considered as a third form of gall-sickness) appeared on the 3rd day after the second injection, and, five days later, blood changes (Poikilocytosis) were noted, remaining for another two days.

Tested on the 26th March, 1907, by a subcutaneous injection of 10 c.c. blood of heifer 425, an animal which contained Piroplasma bigeminum (ordinary redwater) and Piroplasma mutans (a form of gall-sickness) in its blood. A slight temperature reaction followed, and, on the 26th day, Piroplasma bigeminum (ordinary redwater) appeared.

"*C*," *Heifer* 421.—Two-year-old heifer from Aliwal North, and susceptible to ordinary redwater.

Injected on the 31st December, 1906, intrajugularly with 5 c.c. blood of heifer 428. As no reaction ensued, and all blood examinations were negative, heifer 421 was reinjected subcutaneously on the 3rd January, 1907, with 50 c.c. of heifer 428. With the exception of a sharp rise to 104° on the 3rd day, after this latter injection, the temperature remained normal, and no piroplasms (English redwater) were noted in the blood.

Tested on the 30th January, 1907, by subcutaneous injection of 10 c.c. blood of heifer 426 containing Piroplasma bigeminum (ordinary redwater).

Reaction from the 5th day, Piroplasma bigeminum (ordinary redwater) being noted four days later.

"*D*," *Heifer* 422.—Injected on the 13th December, 1906, subcutaneously with 10 c.c. blood of heifer 428.

Temperature remained normal until the 17th day, when a sharp rise occurred, reaching 105.2°, but all microscopical examinations were negative. Heifer 422 was, accordingly, reinjected on the 31st January, 1907, subcutaneously with 50 c.c. blood of heifer 428. Again no reaction ensued, the temperature consistently remaining about 102° to 103°. All examinations negative, with the exception of the presence of rare Trypanosoma theileri (another form of gall-sickness) on the 6th January, 1907. Tested on the 30th January, 1907, by subcutaneous injection of 10 c.c. blood of heifer 425, containing Piroplasma bigeminum (ordinary redwater) and Piroplasma mutans (a form of gall-sickness).

Reaction from the 15th day, reaching 104.2° the following day, and remaining high for about two weeks. Piroplasma bigeminum (ordinary redwater) noted on the 25th day.

The following South African cattle, Nos. 401, 419, 420, 423 and 424, were all injected with blood of English heifer No. 430. This heifer (compare Experiment 1, "*B*") had been inoculated in England with English redwater, and, as a result, gave a temperature reaction accompanied with the presence of piroplasms (English redwater).

"*E*," *Heifer* 401.—A two-year-old heifer from Aliwal North, and susceptible to ordinary redwater.

Injected on the 13th December, 1906, subcutaneously with 10 c.c. blood of English heifer 430. As this inoculation failed to cause a reaction, and no piroplasms (English redwater) were noted in the blood, heifer 401 was reinjected on the 3rd January, 1907, subcutaneously with 50 c.c. blood of 430. Again no temperature reaction ensued, and all blood examinations were negative.

Tested on the 30th January, 1907, by subcutaneous injection of 10 c.c. blood of heifer 425, containing Piroplasma bigeminum (ordinary redwater).

Reaction from the 6th day, returning to normal seven days later. Secondary reaction from the 19th day, reaching 107.4° on the 33rd day, and during which Piroplasma bigeminum (ordinary redwater) appeared.

"*F*," *Heifer* 419.—A two-year-old heifer from Aliwal North, and susceptible to ordinary redwater.

Injected on the 13th December, 1906, subcutaneously with 10 c.c. blood of heifer 430.

No temperature reaction, and all examinations of blood negative. Heifer 419 was then reinjected on the 3rd January, 1907, subcutaneously with 50 c.c. blood of heifer 430 with the result that the temperature remained normal, and no piroplasms (English redwater) or blood changes were noted.

Tested on 26th March, 1907, by subcutaneous injection of 10 c.c. blood of heifer 425, an animal immune against ordinary redwater. Reaction six days later, reaching 104.2° on the 3rd April, 1907. Piroplasma bigeminum (ordinary redwater) noted on the 9th day.

"*G*," *Heifer* 420.—A two-year-old heifer from Aliwal North, and susceptible to ordinary redwater.

Injected on the 13th December, 1906, subcutaneously with 10 c.c. blood of English heifer 430.

No result, and 420 was accordingly injected on the 31st January, 1907, subcutaneously with 50 c.c. of heifer 430. Temperature remained quite normal, and daily examinations of the blood failed to reveal any piroplasms (English redwater).

Tested on immunity on 31st January, 1907, by subcutaneous injection of 10 c.c. blood of heifer 425, an animal immune to ordinary redwater.

Typical ordinary redwater reaction from 5th day, but Piroplasma bigeminum (ordinary redwater) not present. Secondary reaction from 17th day, lasting for about two weeks, and during which time, Piroplasma bigeminum (ordinary redwater) and the lesions of anæmia appeared.

"*H*," *Heifer* 423.—A two-year-old heifer from Aliwal North, and susceptible to ordinary redwater.

Injected on the 13th December, 1906, intrajugularly with 5 c.c. blood of heifer 430.

As this injection failed to produce any results, 423 received a subcutaneous injection of 50 c.c. from heifer 430 on the 3rd January, 1907.

With the exception of a sharp rise to 104.2°, eight days later, the temperature remained normal and no piroplasms (English redwater) were seen in the blood preparations.

Tested on immunity on 30th January, 1907, by subcutaneous injection of 10 c.c. blood of heifer 426, immune to ordinary redwater. Reaction from the 6th day, Piroplasma bigeminum (ordinary redwater) appearing three days later.

"*I*," *Heifer* 424.—A two-year-old from Aliwal North, and, therefore, susceptible to ordinary redwater.

Injected on the 13th December, 1906, subcutaneously with 10 c.c. defibrinated blood of heifer 430. Temperature remained normal, and all blood examinations were negative. Accordingly, 424 received a subcutaneous injection of 50 c.c. blood of heifer 430 on the 3rd January, 1907.

No result, the temperature remained normal, and no piroplasms (English redwater) were seen in the blood preparations.

Tested on immunity on 30th January, 1907, by subcutaneous injection of 10 c.c. blood of heifer 426, an animal containing Piroplasma bigeminum (ordinary redwater) in its blood.

Typical ordinary redwater reaction from the 6th day, but Piroplasma bigeminum (ordinary redwater) not seen, although blood changes (Poikilocytosis) and anæmia (polychromatic cells) were present.

Heifer 424 was again injected on the 8th March, 1907, with blood containing Piroplasma bigeminum (ordinary redwater) and Piroplasma mutans (a form of gall-sickness) from heifer 409.

No reaction, Piroplasma mutans (a form of gall-sickness) only appearing.

Notes on Heifers 400, 418, 421, 422, 401, 419, 420, 423 *and* 424.

With regard to these nine heifers two injections of English redwater blood failed in every instance to cause a reaction, and piroplasms (English redwater) did not appear.

A subsequent inoculation of South African redwater caused these injected heifers to contract this disease, and, with the exception of Nos. 400 and 424, Piroplasma bigeminum (ordinary redwater) appeared in every animal.

Heifers 400 and 424 were reinjected with blood containing Piroplasma bigeminum (ordinary redwater), the result being that no reaction ensued, nor were piroplasms (ordinary redwater) present.

Conclusions.

I do not feel justified in drawing any conclusions from the results of the injection of heifers 400, 418, 421 and 422 with blood of English heifer No. 428, for, as will be seen from Experiment 1, "*A*," this heifer did not appear to have contracted the infection in England, as no piroplasms (English redwater) were seen, due to an inoculation of English redwater blood, and the reaction was atypical. I therefore consider that the failure of heifer 428 to contract English redwater from the injection of virulent blood is another point in favour of my contention that English redwater is not always inoculable. The results obtained from the other five heifers, however, seem to be conclusive, as heifer 430 was certainly infected with English redwater.

Therefore, English redwater was not inoculable in our five South African heifers, and, accordingly, when tested, they all contracted ordinary redwater, proving that they had not acquired any immunity against South African redwater.

Exposure Experiments with the Imported Heifers.

Continuing on the lines of the arrangement made between Mr. Stockman and myself, the imported Ayrshire heifers were exposed on the farm "Linwood," near Pretoria. The temperatures were taken daily, and the blood examined from time to time.

Heifer No. 428.—Exposed on the 5th January, 1907. Three days after the temperature commenced to rise, reaching 106°, and constantly remaining high during the next 47 days. Nothing particular was noticed in the blood at the beginning of this reaction, but, on the 35th day, Piroplasma bigeminum (ordinary redwater) was noticed, remaining for some days, but disappeared from the 39th day. Blood changes (Poikilocytosis) were occasionally noted, and the temperature returned to about normal on the 26th February. A second rise ensued on the 4th March, Piroplasma bigeminum (ordinary redwater) not being noticed, but blood changes (Poikilocytosis) and marginal points (the sequel of ordinary redwater) appeared, and the animal remained very weak. Death occurred on the 17th March with all the lesions of the sequel of ordinary redwater. The anæmia was so pronounced that the blood consisted almost entirely of basophile, polychromatic and nucleated cells (acute anæmia).

Heifer No. 430.—Exposed at Linwood on the 5th January, 1907. Temperature commenced to rise on the 12th January, and then oscillated very irregularly for the next month; microscopical examination of the blood at repeated intervals failed to reveal Piroplasma bigeminum (ordinary redwater), but blood changes (Poikilocytosis) were noted.

Recovered.

Heifer No. 429.—Exposed at Linwood on the 5th January, 1907. Reaction commenced six days after exposure, when the temperature rose to over 106°, and remained high for the following fourteen days. Spirillum (Spirillosis-fever of cattle), anæmia (basophile cells), blood changes (Poikilocytosis), and marginal points (sequel of ordinary redwater) were noted, but Piroplasma bigeminum (ordinary redwater) did not appear.

Recovered.

Heifer No. 432.—Exposed at Linwood on the 5th January, 1907. Irregular temperature noted soon after, and rose about three weeks later to a high elevation, touching 105.8°; Piroplasma bigeminum (ordinary redwater), blood changes (the lesions of Poikilocytosis), anæmia (basophile granulations and polychromatic cells) were present.

Recovered.

Heifer No. 431.—Exposed at Linwood on the 5th January, 1907. This animal also showed an irregular high temperature, reaching over 105°, and, as the maximum, recorded 106°. Blood changes (Poikilocytosis) anæmia (basophile granulations), and Spirillum (Spirillosis-fever of cattle) were noted. Piroplasma bigeminum (ordinary redwater) was not present.

Recovered.

Heifer No. 433.—Exposed at Linwood on the 5th January, 1907. Irregular temperature noted on the 12th January, commencing with 106°, maintaining high for the next fourteen days, and touching 106.8° on the 31st January, 1907. Anæmia

(Basophile granulations, polychromatic cells) and blood changes (Poikilocytosis), accompanied with the sequel of ordinary redwater (marginal points) were noted. Piroplasma bigeminum (ordinary redwater) was not noted, but the lesions of anæmia increased, and the animal died as the sequel of ordinary redwater.

RÉSUMÉ.

Heifer No.	Particulars.	Results when exposed to natural infection of ordinary redwater.
428	Not immune to English redwater ...	Reaction with Piroplasma bigeminum; died of ordinary redwater.
430	Immune to English redwater ...	Reaction: recovered.
429	Immune to ordinary redwater ...	Reaction; recovered.
432	Immune to ordinary redwater ...	Reaction with Piroplasma bigeminum; recovered.
431	Immune to ordinary redwater, but susceptible to English redwater	Reaction; recovered.
433	Immune to both English and South African redwater	Reaction: died of sequel of ordinary redwater.

* * * *

I have already expressed the opinion that English redwater does not offer protection against our ordinary redwater. Of the four animals which had Piroplasma bigeminum (ordinary redwater) in their blood, due to the primary injection, after exposure they all more or less showed lesions which could be identified with a new reinfection of ordinary redwater. It will be seen from the experiments quoted that the inoculation of English cattle with South African redwater did not give a complete guarantee against a natural infection of ordinary redwater, and we may to some extent explain the reason for this apparent failure. The animals arrived in December; almost directly after they were exposed, and, naturally, at a time when the tick infection was at its maximum, so that they had to become acclimatised under very adverse conditions. From previous experience we know that an animal immune against redwater may break down in immunity under the influence of a subsequent heavy tick infection, and, taking this fact into consideration, together with the loss of only one English heifer, I am of opinion that the experiment has afforded very encouraging results.

At a later date I hope to continue these investigations, but to take further precautions that the injected cattle, directly after their arrival from England, be kept in a paddock to ensure acclimatisation, and exposed on the veld when the tick infection is at its minimum.

THE CHEMICAL SECTION.

1.—NOTE ON THE PREPARATION OF SEED BEDS FOR NURSERIES, Etc.

By Herbert Ingle, B.Sc., F.I.C., Chief Chemist.

The production of vigorous young plants with the least loss is one of the most important objects of the nurseryman, gardener, tobacco grower and others. The writer has of late been greatly impressed with the improvement in the growth of young seedlings produced by previously sterilising the soil in which they are grown.

In certain experiments of his own he has found that seeds planted in sterilised soil grew vigorously and produced healthy plants while in the same soil unsterilised, but otherwise under the same conditions, the mortality among the seedlings was enormous.

Moreover, in accounts of recent experiments with plants conducted in Europe, he has noticed that altogether apart from the influence of previous sterilisation upon the particular disease under investigation there has generally been noticeable a distinct and marked improvement in the vigour of plants grown in the sterilised soil.

Several nurserymen and others who are occupied in rearing plants from seed have told him of the trouble and losses they often experience owing to "damping off" (due to the attack of fungi—*Pythium spp.*) of young seedlings. It may therefore be of service and interest to such persons to try the effect of sterilisation of the soil they employ in their seed beds, and it occurred to the writer that some suggestions as to how this could be effected with the ordinary appliances available in a nursery might be useful.

The most drastic method of effecting complete sterilisation would be to heat the soil to a high temperature by direct contact with fire, but such treatment is objectionable for several reasons. It would entail the destruction of the organic matter of the soil and the almost complete loss of the nitrogen which it contained, and the physical properties of the soil (*e.g.*, its water-retaining power) would be profoundly altered. Steaming the soil for a sufficient time will be found far preferable, for though the destruction of all organisms and spores may not be thus achieved, the number left will in most cases be small, and may be neglected.

The effect of sterilisation upon soil is probably both beneficial and injurious—the former because it destroys fungi and micro-organisms which act injuriously upon young plants, the latter because the organisms concerned in nitrification (*i.e.*, the change of the nitrogen contained in the soil in the form of complex organic compounds into the readily assimilable nitrates) are also destroyed.

We find that by steaming soil for two or three hours it may be sufficiently sterilised without taking up too much moisture. After cooling down to air temperature the soil is ready to receive the seeds. Many ways of effecting the sterilisation by steam will probably suggest themselves, and the details of the method to be adopted will to a great extent be determined by the appliances available.

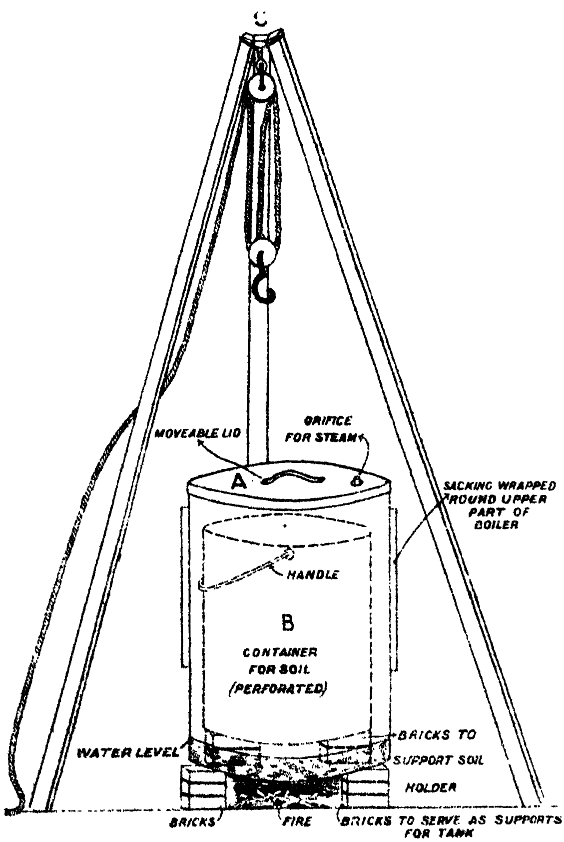
The chief points to be kept in mind are:—

1. To avoid direct contact of the soil with water lest leaching and washing out of soluble matter should occur.
2. To ensure that the whole of the soil becomes as hot as steam will make it.

As to the method of carrying out the sterilisation, much depends upon the appliances available, and each one for himself may be able to introduce little modifications which may be convenient.

The following description is thus to be taken as merely a rough guide as to what is wanted, and may doubtless be greatly modified to suit circumstances, and particularly to suit the scale on which the process is to be carried out:—

The Steamer.—A water-tight vessel of considerable size should be supported on stones or bricks in such a manner that a fire may be made beneath it. A corrugated iron tank, or even a drum such as is used for containing the glycerine imported into this country for the manufacture of explosives would probably be found suitable. In any case the vessel should be of considerable depth, should have



General arrangement for sterilising soil.

a cover with only a small orifice, and if the upper part could be "lagged" or jacketed by some non-conducting material an economy of fuel would be effected.

Only a few gallons of water should be placed on the bottom of this tank or vessel.

The container for the soil should be, partially at least, composed of perforated metal or strong wire gauze, and should be as large as can be conveniently moved, and as will go into the steaming vessel. It should be suspended or supported so that its lower surface is some 6 inches or 8 inches above the level of the water, and just low enough for the cover of the outer vessel or tank to fit over it. A simple tripod or "three legs" with pulleys erected over the boiler and fire will probably be found useful in lifting in and out the vessel containing the soil.

When all is ready, several gallons of water should be placed in the boiler, the lid put on, the fire lighted and the water heated to boiling. Then the lid should be removed and the vessel, containing as much soil as can be managed at once, lifted and lowered into the boiler, the rope or chain removed, the lid replaced, and the fire kept hot enough to make steam issue from the orifice of the boiler for at least three hours, replenishing the water if necessary so as to avoid the boiler becoming dry. After three hours' steaming it may safely be assumed that the sterilisation is complete and the lid of the boiler may be removed, the vessel containing the soil lifted out by means of the rope or chain and pulleys, the soil emptied out and a fresh charge introduced.

It will be found that the soil while being so treated takes up but little water, provided care be taken to prevent actual splashing of water from the boiler on to the soil.

Of course the vessel containing the soil should be placed concentrically in the boiler, so that it is entirely surrounded by the hot steam, but is some height above the water. When sufficient soil has been thus sterilised it should be spread to the depth of at least 4 in. or 5 in. on the seed beds prepared in the usual way and the seed sown in it.

If manuring be desired it could be readily done by dissolving or suspending the appropriate manure in the water used to moisten the seed bed. A suitable *general* manuring would be to water the soil with a well-stirred mixture of

Water	20 gallons.
Sulphate of potash	½ lb.
Superphosphate	½ lb.
Nitrate of soda...	½ lb.

about twelve hours or so before sowing the seed. If the soil employed be poor in lime, as so many of our soils are, it would be an advantage also to mix a little powdered white lime thoroughly with the soil before sterilising—say about 1 oz. to each 20 lbs. of soil.

I feel confident that after such treatment seed beds would be found to give much stronger and more vigorous plants than are obtained by the ordinary methods of culture, especially in damp weather when the development of *Pythium* and other fungi is apt to be very rapid.

The trouble and expense involved in the process of sterilisation would be more than repaid by the gain in vigour of the seedlings and

the process should prove very useful in the rearing of young trees, particularly pines, and of tobacco.

With tobacco growers it is the custom in many cases to partially sterilise the seed beds by burning bushwood upon them prior to sowing, but I am of opinion that the method here suggested would be found more effective and satisfactory.

Should the soil available be deficient in water-retentive power the addition of a small quantity of some porous vegetable matter, *e.g.*, jadoo fibre (an analysis of which is given in this *Journal*, Vol. III., p. 264), to the soil before sterilisation will be an improvement.

In conclusion, I would also advise that the water (which should be as pure as is obtainable) used for watering the seed beds should have dissolved in it a very small quantity of nitrate of soda—about ¼ oz. to 10 gallons would be ample—so that the seedlings may be assured of a constant supply of combined nitrogen in spite of the probable stoppage of nitrification in the soil consequent upon the destruction of the nitrifying organisms by the sterilisation. This is important for the first week or two, after which nitrification would probably commence again owing to the accidental introduction of the nitrifying organisms either in the water applied or by dust.

II.—THE VARIABILITY OF THE FAT CONTENT OF MILK.

By Herbert Ingle, B.Sc.

That the proportion of fat in the milk given by a cow is liable to much greater variation than was generally thought was shown by the investigations of the writer in 1900, 1901 and 1902*, and confirmation has been furnished by numerous researches carried out since then.

One of the causes which has a great influence upon the fat content of any particular milking is the interval that has elapsed between that milking and the preceding one. As a general rule the longer the interval preceding a milking the smaller is the percentage of fat in the milk, though, of course, the larger the yield of milk.

The results obtained in the milking trials at the recent Witwatersrand Agricultural Show exhibit the effect of this influence in a marked manner, and a full report of them may be of interest to some of our readers.

Four animals competed in the class for the cow giving the largest quantity of butter fat and the milk given at five milkings—two in the mornings and three in the evenings—were considered. The intervals between the milkings were very unequal—viz., eight hours and sixteen hours—the times for milking being 9 a.m. and 5 p.m.

* See papers in the "Transactions of the Highland and Agricultural Society of Scotland" for the years 1901, 1902, and 1903.

The cows may be designated A, B, C and D, and the results were as follows:—

Cow A.—Morning Milk.	Yield of milk.	Fat content.	Weight of fat in milk.
April 30th	28·26 lb.*	2·1%	0·593 lb.
May 1st	32·2 lb.	2·3%	0·741 lb.
Total ...	60·46 lb.	Mean = 2·21%	1·334 lb.
Evening Milk.			
April 29th	20·6 lb.	5·1%	1·051 lb.
April 30th	18·7 lb.	4·3%	0·804 lb.
May 1st	20·3 lb.	5·05%	1·025 lb.
Total ...	59·6 lb.	Mean = 4·83%	2·880 lb.

The whole milk contained therefore 3·65% fat;
or one day's milk would contain 3·25% fat.

Cow B.—Morning Milk.	Yield of milk.	Fat content.	Weight of fat in milk.
April 30th	20·9 lb.	2·5%	0·523 lb.
May 1st	20·9 lb.	3·3%	0·690 lb.
Total ...	41·8 lb.	2·90%	1·213 lb.
Evening Milk.			
April 29th	11·6 lb.	4·0%	0·464 lb.
April 30th	11·9 lb.	4·3%	0·512 lb.
May 1st	10·9 lb.	4·1%	0·447 lb.
Total ...	34·4 lb.	4·13%	1·423 lb.

The whole milk therefore contained 3·46% fat;
or one day's milk would contain 3·38% fat.

Cow C.—Morning Milk.	Yield of milk.	Fat content.	Weight of fat in milk.
April 30th	32·2 lb.	2·3%	0·741 lb.
May 1st	29·3 lb.	1·9%	0·567 lb.
Total ...	61·5 lb.	2·13%	1·308 lb.
Evening Milk.			
April 29th	18·0 lb.	4·0%	0·720 lb.
April 30th	17·7 lb.	3·4%	0·602 lb.
May 1st	19·6 lb.	5·1%	1·000 lb.
Total ...	55·3 lb.	Mean = 4·20%	2·322 lb.

The whole milk therefore contained 3·11% fat;
or one day's milk would contain 2·91% fat.

Cow D.—Morning Milk.	Yield of milk.	Fat content.	Weight of fat in milk.
April 30th	28·9 lb.	3·45%	0·997 lb.
May 1st	27·7 lb.	2·90%	0·803 lb.
Total ...	56·6 lb.	Mean = 3·18%	1·800 lb.
Evening Milk.			
April 29th	19·0 lb.	7·4%	1·406 lb.
April 30th	17·4 lb.	7·05%	1·227 lb.
May 1st	16·4 lb.	6·10%	1·000 lb.
Total ...	52·8 lb.	Mean = 6·87%	3·633 lb.

The whole milk therefore contained 4·96% fat;
or one day's milk would contain 4·57% fat.

* The yield of milk was actually *measured* not *weighed*, but the weights have been calculated on the assumption that a gallon of milk weighs 10·3 lbs. which is approximately true in most cases.

The actual percentage of fat in the aggregate milk from each cow at the five milkings does not correctly represent the performance of each cow, since there were only two morning's and three evening's milking. I have therefore calculated the actual average of two milkings—one morning's and one evening's, for each cow, and these figures more fairly represent the relative richness of the milk from the various animals.

Regarding the fat content only we have the following comparisons between morning and evening milk:—

	Morning samples.	Evening samples.
Cow A	2·1 2·3	5·1 4·3 5·05
Cow B	2·5 3·1	4·0 4·3 4·1
Cow C	2·3 1·9	4·0 3·4 5·1
Cow D	3·45 2·90	7·4 7·05 6·10
Arithmetical mean	2·57%	4·99%

or if all the morning milk were mixed together the mixture would amount to 220.36 lbs. containing 5.655 lbs. of fat, or would contain 2.566 per cent. of fat, while the total quantity of evening milk (three milkings) amounted to 202.1 lbs. containing 10.258 lbs. of fat, or 5.075 per cent. of fat.

The two sets of means, viz., 2.57 and 2.566 and 4.99 and 5.075, do not agree exactly since the various separate samples examined were not representative of equal quantities of milk.

Thus we may say that the united morning milk of the four cows on the two mornings examined contained in round numbers 2.6 per cent. of fat, while the united evening milk of the same animals on the three evenings examined contained 5.0 per cent. of fat, or that the evening milk was on the average nearly twice as rich in fat as the morning milk, which is nearly proportional to the intervals between the milkings. The fact that the proportion of fat in the milk from consecutive milkings of a number of cows is approximately inversely proportional to the interval which precedes the milking I have often noticed.

Thus in 1902 in an investigation on the effect of changing the intervals between the milking with five cows I obtained the following:—

	Fat in morning.	Fat in evening.
Intervals—9 and 15 hours	2·94	4·50
11½ and 12½ hours ...	3·20	3·68
9 and 15 hours	2·90	4·48

while the yield of milk at each milking is nearly directly proportional to the interval which precedes it.

Taking the figures obtained at the show and expressing them in forms of ratios we have—

	a.m.		p.m.
Ratio of intervals preceding milking (16 hours and 8 hours) ...	2	:	1
Yield of milk at each milking (ratio)	1·64	:	1
Ratio of fat percentage in the two milkings	1	:	1·92

while the figures obtained in the 1902 investigation gave

Ratio of intervals (15 hours and 9 hours)...	1·66	:	1
Ratio of yields	1·51	:	1
Ratio of fat percentage in milk	1	:	1·53

and

Ratio of intervals ($12\frac{1}{2}$ hours and $11\frac{1}{2}$ hours)	1·09	:	1
Ratio of yields of milk	1·17	:	1
Ratio of fat percentage present	1	:	1·13

How nearly all the four animals at Johannesburg agreed with this generalisation is shown by the following table giving the average fat content in the morning and evening milk of each cow, and the ratios of these figures:—

	% Fat, a.m.	% Fat, p.m.	Ratio.
Cow A	2·21	4·83	1 : 2·184
Cow B	2·90	4·13	1 : 1·424
Cow C	2·13	4·20	1 : 1·970
Cow D	3·18	6·87	1 : 2·158

It will be noticed that the greatest variation when expressed as a ratio is shown by cows A and D, while in the case of cow B the fat in the morning and evening milk is more nearly equal.

From my previous experience I should say it is probable that cow B was further advanced in lactation than cows A and D at the time of the show. I learnt that cows A and D were each about three weeks after calving at the time, but I did not ascertain the stage of lactation of the other two cows.

With reference to the proportion of fat in milk I may refer here to the widespread belief among cowkeepers that the use of rich, nutritious food tends to increase the richness of the milk in fat.

By direct experiment, however, I have shown that the influence of food upon the fat content of milk is exceedingly small, and in any case only temporary. If a cow, fed upon somewhat poor food, be given food much richer in albuminoids there appears to be a very slight increase in the percentage of fat in her milk for a short time, but the effect soon passes off even if the rich feeding be continued, and in any case the change produced is very small. But the *yield of milk* is considerably affected by the food. The practical lesson to be learnt by dairymen from the figures quoted is that if they desire their milk to be uniform in quality they must milk their cows at equal and regular intervals. When cows are habitually milked at equal intervals of twelve hours little difference in fat content between evening and morning milk will be shown by the mixed milk of a herd.

But the milk of an individual cow, even under these conditions, may show considerable variation in fat content from milking to milking.

In conclusion, I may point out that cow D (a small cow, weighing I should estimate about 700 to 750 lbs.) gave a very meritorious performance, yielding, in five consecutive milkings, 109.4 lbs. (*i.e.*, 10 gallons, 5 pints) of milk containing 5.433 lbs. of butter fat

(corresponding to about 6 lbs. of butter) that is, containing an average of 4.96 per cent. of fat. The animal, though black in colour, was evidently largely of the Jersey breed.

I may also call attention to the fact which I have often observed that milk trials at agricultural shows are often rendered unsatisfactory and misleading by the effect of strange surroundings, the excitement of being brought to the show and a general disturbance of the placidity of existence upon the cows. In some cases, especially with animals of nervous temperament, such influences greatly disturb the production of milk and often affect not only its quantity but its quality, and particularly its proportion of fat.

So far as I could see, however, I do not think that the animals at the Johannesburg Show were greatly affected by these circumstances, and since the competition involved five milkings probably such influences were eliminated. But in competitions where only one or two milkings are considered, the effects I have mentioned may greatly influence the result.

III.—MANURIAL EXPERIMENTS WITH MAIZE AND COW-PEAS.

By R. D. Watt, M.A., B.Sc., and Herbert Ingle, B.Sc.

The necessity of doing all that is possible to improve the existing methods of growing maize ("mealies") has been repeatedly urged of late and much stress has been laid upon the importance of choice of variety, methods of cultivation, time of sowing and other points, but the influence of a factor which is perhaps more potent than any other has rarely been alluded to. Unless the soil in which the plants are grown contain all the essential ingredients of plant food in sufficient quantity and in available form a full crop cannot be obtained. It is therefore obvious that attention to this point is also essential to success, for unless deficiencies in the soil be made good by judicious manuring the maximum yield cannot be obtained. We have recently had an opportunity of demonstrating the effect of manuring upon maize and cow-peas and an account of the somewhat striking results may be of general interest.

By the kind co-operation of Mr. Patrick Fowlie plots were measured off on an apparently uniform piece of land at Koedoespoort, to the east of Pretoria. The land had been freshly broken up the previous year and had yielded one crop of maize without manure. Samples of the soil (upper twelve inches) were collected in December, 1907, before the manures were applied. On subsequent analysis the soil yielded the following figures:—

Moisture	0·56
*Loss on ignition (organic matter, etc.)	2·45
Insoluble matter (sand, etc.)	91·85
Iron oxide and alumina	4·75
Lime	0·01
Magnesia	0·06
Potash...	0·06
Phosphorus pentoxide	0·02
	99·76

*Containing nitrogen 0·057.

"Available" potash	0·0009
" phosphorus pentoxide	0·0018

Thus showing the soil to be extremely poor in all elements of plant food. In potash particularly the soil is, as compared with most of our Transvaal soils, extremely poor. The figures for "available" plant food show that there was great need of potash and phosphatic manuring.

The land was carefully measured out into plots one-twentieth of an acre in area, and the plots were then ploughed and harrowed and then manured as follows, the manures being broadcasted on the surface and immediately harrowed in.

The order and manurial treatment of each plot is given in the following schedule:—

Plot.		
I.	No manure.	
II.	Nitrate of soda	200 lb. per acre.
III.	Sulphate of ammonia	160 " "
IV.	Superphosphate	400 " "
V.	Basic slag	400 " "
VI.	No manure.	
VII.	Lime	400 " "
VIII.	Sulphate of potash	150 " "
*IX.	Nitrate of soda	200 " "
	Superphosphate	400 " "

The maize (variety Chester County Mammoth) was sown the next day (13th December, 1907) in rows 3 feet apart and about 18 inches apart in the rows. The cow-peas (variety "Black-eyed Susan") were also sown the same day in rows 20 inches apart. It is to be noted that the experiment was begun very late in the season, so that the maize had really not sufficient time to properly mature, especially as unfortunately the rainfall subsequent to the sowing was so low. The following gives the actual rainfall recorded by Mr. Brooke, at Silverton, but a short distance to the south-east of the land where the experiment was conducted:—

	Inches.
From 30th November to 13th December	2·56
Plots sown on 13th December—	
13th December to 31st December, 1907	1·06
1st January to 31st January	3·22
February	1·58
March	2·02
April	0·10
Total since sowing	7·98 inches.

On such a sandy porous soil this rainfall was probably inadequate for the requirements of the plants.

MAIZE.

The seed germinated well, and a difference in the rate of growth on the various plots soon became apparent.

By 11th February, 1908, plot IX. was far and away the best, followed by plot VIII. and plot III., the other plots being but little, if any, better in appearance than the unmanured plots.

Plot II. (nitrate of soda) was apparently damaged by a "wash out" for many of the plants, and much of the soil were washed away. The yield of this plot was therefore ignored.

* We may remind the reader that nitrate of soda and sulphate of ammonia serve as sources of combined nitrogen and that superphosphate and basic slag are valuable for the phosphoric acid which they contain.

By April growth had almost ceased, and very great differences in the plots were observable. These are well seen in Plates 63 and 64, which are reproductions of photographs taken on 4th April.

It was noticed that "witch weed" (*Striga coccinella*) was abundant on the plots and apparently largely parasitic on the maize plants. The cobs were left on the plants until 15th May when they were harvested, shelled and the grain weighed.

The yields, calculated to pounds of grain per acre, were as follows:—

Plot.	lb.
I.—Unmanured	110
II.—Nitrate of soda (spoilt).	
III.—Sulphate of ammonia	220
IV.—Superphosphate	360
V.—Basic slag	280
VI.—No manure...	130
VII.—Lime	200
VIII.—Sulphate of potash	545
IX.—Nitrate of soda and superphosphate	1,345

It will be seen that the yield from plot IX.—1,345 lbs.—is about eleven times as great as the average of those of the two unmanured plots—120 lbs.

Arranging the yields in ascending order the following results are shown:—

	lb.
A.—Unmanured plots (average)...	120
B.—Lime	200
C.—Sulphate of ammonia	220
D.—Basic slag	280
E.—Superphosphate	360
F.—Sulphate of potash	545
G.—Nitrate of soda and superphosphate	1,345

Plate 65 shows, in a graphic manner, the relative amounts of grain produced by the various plots, each tube containing one fifteen-thousandth of the total yield per acre of the respective plot. The results are very striking, showing that by the use of nitrate of soda and superphosphate it is possible to obtain eleven times the quantity of grain that would be yielded without manure.

We may point out that had we arranged a plot on which nitrate of soda, superphosphate and sulphate of potash had been used, a still higher yield would probably have resulted, but as a rule our soils are well supplied with potash, and we did not, at the time, expect that potash manuring would have much effect. Why it had is shown by the results of the analysis of the soil, from which it is clear that potash is very deficient.

The enormous increase in crop on poor soil such as this is evident from the figures, but the practical farmer will want to know whether the value of the increase will pay for the cost of the manure used. We regret to say that with the present high price of artificial manures in this country consequent upon the enormous cost of transport, the actual figures show a slight loss. But it must be remembered that the crop was sown too late, that we had a very dry season, particularly during the growing period of the crop and somewhat large dressings of manure were used, our main object being to demonstrate the effect of manuring with the various substances.

Then, too, it must also be recognised that many of the manures leave the land much richer for another year, and that next year's crops will benefit considerably. This is true of the lime, basic slag, superphosphate, though the effect of the nitrate of soda upon next year's crop will probably be *nil*, or at most very small. The following may be taken as the present value of the various manures in Pretoria, the prices being based upon market prices in Durban to which has been added £2 8s. 4d. per ton for railage to Pretoria:—

	Per ton. £	s.	d.
Superphosphate	7	13	4
Basic slag...	6	18	4
Nitrate of soda	14	18	4
Sulphate of ammonia	17	18	4
Sulphate of potash	15	18	4
Lime (local)	3	10	0

On this basis the actual cost of the manures on the various plots per acre would be as follows:—

Plot.	£	s.	d.
I.—Nothing.			
II.—Nitrate of soda, 200 lb.	1	9	10
III.—Sulphate of ammonia, 160 lb.	1	8	8
IV.—Superphosphate, 400 lb....	1	10	8
V.—Basic slag, 400 lb.	1	7	8
VI.—Nothing.			
VII.—Lime, 400 lb.	0	11	0
VIII.—Sulphate of potash, 150 lb.	1	3	10
IX.—Superphosphates, 400 lb.: Nitrate of soda, 200 lb.	3	0	6

We may assume that the grain was worth 10s. per bag of 200 lbs. The values of the increase over the average of the unmanured plots would then be:—

Plot.		£	s.	d.
III.—220 — 120 = 100 lb.	...at 10/- per 200 lb. =	0	5	0
IV. 360 — 120 = 240 lb.	... " " =	0	12	0
V.—280 — 120 = 160 lb.	... " " =	0	8	0
VII.—200 — 120 = 80 lb.	... " " =	0	4	0
VIII.—545 — 120 = 425 lb.	... " " =	1	1	3
IX.—1,345 — 120 = 1,225 lb.	... " " =	3	1	3

Thus on every plot but one the value of the increase in grain was less than the cost of the manure, so that even if we assume that the value of the stalks were just sufficient to pay for the labour of manuring there would be a loss through manuring.

As already stated the conditions under which the crop were grown were very unfavourable, the rainfall being very small, the crop very late and the land very poor.

The Residual Values of the Manures Applied.

I.—Nitrogenous Manures.

In Europe it is usually assumed that nitrate of soda and sulphate of ammonia affect only the crop for which they are applied, and have no influence upon subsequent crops.

In this country, with no winter rainfall, it is quite possible that some effect may be produced upon the second year's crop, as there will be no loss by drainage during the winter. However, from lack of data it will be best perhaps to follow the English custom and to assume that these manures have no residual value.

Superphosphate and Nitrate of Soda. No Manure.

Plate 63. **Showing the effect of Manuring upon Maize.**

Sulphate of Potash. Basic Slag.

Plate 64. **Showing the effect of Manuring upon Maize.**

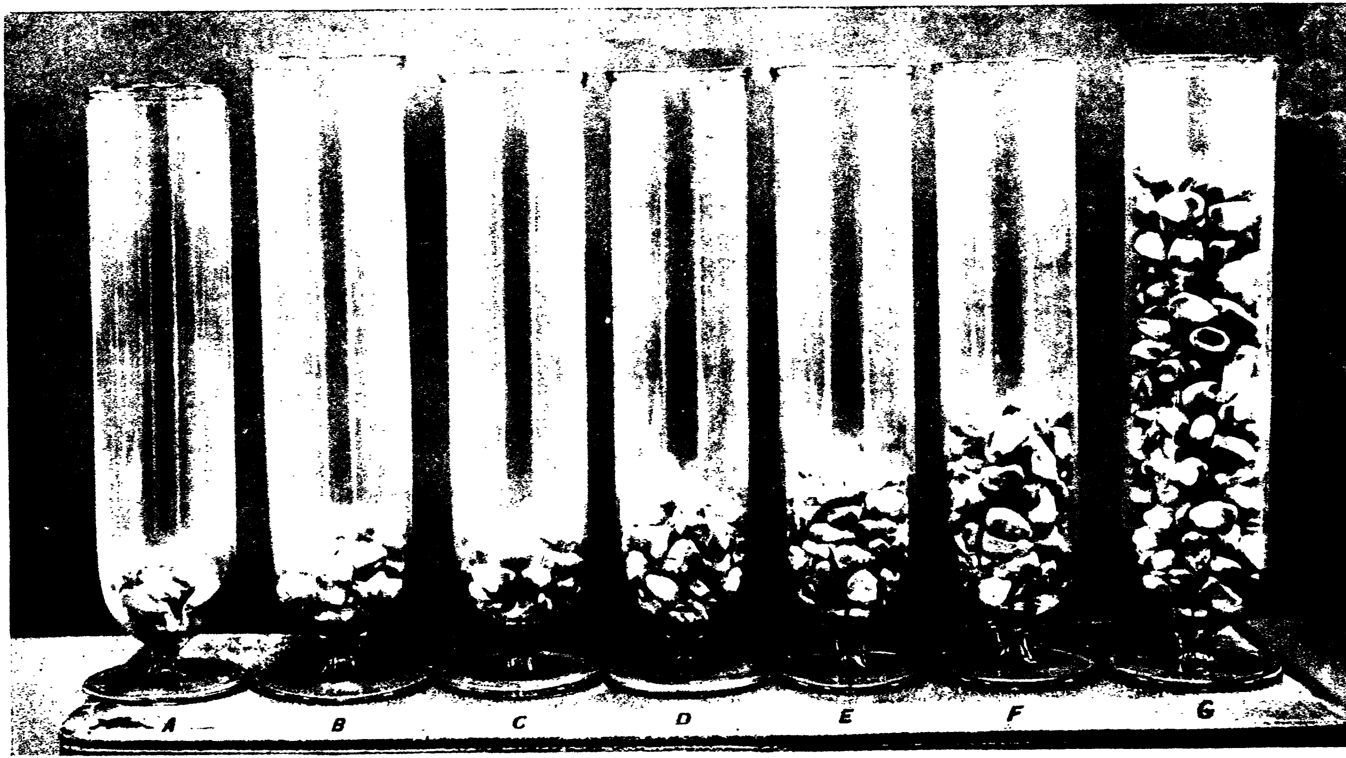


Plate 65.

Showing $\frac{1}{15{,}000}$ of the actual yield of grain per acre from the various plots.

II.—Phosphatic Manures.

There can be no doubt about these manures having considerable residual values. Soils suffer little or no loss in phosphates through drainage, though in some cases the availability of the phosphoric acid considerably diminishes by remaining in the soil. In all probability about half the phosphoric acid applied in the manure remains available for subsequent crops.

On this assumption it is evident that only half the actual cost of the dressings of superphosphate and of basic slag should be debited to the first crop.

III.—Potash Manures.

The same reasoning applies to potash as to phosphoric acid, so that here again we may probably assume that half the sulphate of potash is left for subsequent crops.

IV.—Lime.

In this case we have to consider not only the usefulness of the material as a direct plant food but more particularly its influence upon the physical properties of the soil and its effect in promoting nitrification and other changes. Here, too, it is probable that the effect will extend beyond the first crop, and that the plot on which this substance was used will next year be at a considerable advantage over the unmanured plots.

On the whole therefore it would seem reasonable to charge to each plot for this year only half the cost of the dressings of phosphates, potash and lime, but all the nitrate of soda and sulphate of ammonia which they received.

Calculated in this way we obtain:—

Plot.	Cost of manure. £ s. d.	Value of increase of grain. £ s. d.	Gain or loss over unmanured plots. £ s. d.
III.	1 18 4	0 5 0	Loss—1 13 4
IV.	0 15 4	0 12 0	Loss—0 3 4
V.	0 13 10	0 8 0	Loss—0 5 10
VII.	0 7 0	0 4 0	Loss—0 3 0
VIII.	0 11 11	1 1 3	Gain—0 9 4
IX.	2 5 2	3 1 3	Gain 0 16 1

On this basis plots IX. and VIII. give a slight profit, while the other plots show a loss varying from three shillings per acre with the limed plot to as much as thirty-three shillings and fourpence per acre on the plot receiving sulphate of ammonia. We hope to grow maize again next season on these plots, so that we may confirm or refute the assumption with reference to manurial residues left in the soil.

General Remarks on the Results with Maize.

It will be noticed that nitrogenous manuring alone had very little effect upon the crop (plots II. and III.) and that phosphatic manures alone (plots IV. and V.) only produced a comparatively small increase, but that when nitrate of soda and superphosphate were used together a marked effect was apparent (plot IX.). Potash manuring alone produced considerable effect (plot VIII.)

From the results of the analysis of the soil one would expect that potash, phosphoric acid and nitrogen were the manures required and in the order named.

But the fertility is evidently limited not by any one of these, but to obtain a full crop they must all three be supplied. In the case of plot IX. it is probable that the action of the superphosphate and nitrate of soda upon the soil itself rendered some of the potash present in the soil more available to the plant, though had sulphate of potash been applied as well it is probable that the yield would have been even higher.

A somewhat striking deduction from the experiment is that although by the use of artificial manures on a poor soil the yield of grain may be increased eleven-fold, yet, owing to the present high price of imported manures, such an increase may not be profitable.

We may point out that the dressings used—400 lbs. per acre of superphosphate and 200 lbs. nitrate of soda per acre—are heavier than we should recommend the farmer to apply. About half these quantities are probably advisable for, as we have often pointed out, prices of imported fertilisers are so high that they should be used with caution.

Results with Cow-peas.

These were as striking as with maize, but for a totally opposite reason, viz., the smallness of the effect which manuring had. Little difference between the various plots was visible to the eye at any time during the growth and when the crop was ready for cutting, on 28th February, 1908, there was a fairly uniform growth over all the plots except that plot IX. was a little greener than the rest. The crop was cut by sickle on this day and the green produce weighed.

The weights of the green crop, calculated to yield per acre, were as follows:—

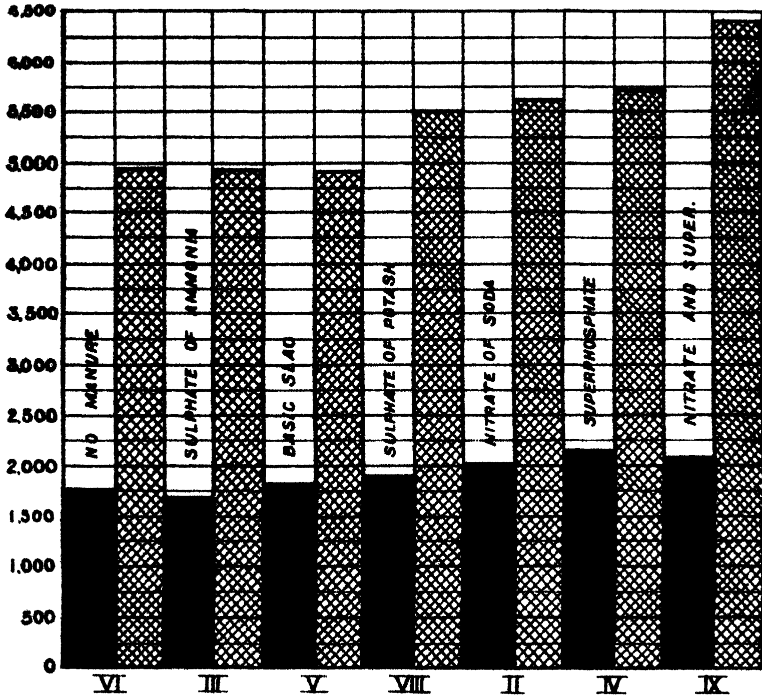
Plot.	lb.
I.—No manure ...	5,300
II.—Nitrate of soda	5,600
III.—Sulphate of ammonia	4,920
IV.—Superphosphate	5,700
V.—Basic slag ...	4,900
VI.—No manure ...	4,940
VII.—Lime ...	4,680
VIII.—Sulphate of potash ...	5,500
IX.—Nitrate of soda and superphosphate	6,380

The crop was left on the land for four days to air-dry, and on 3rd March the resulting hay was weighed:—

Plot.	lb.
I.—No manure ...	1,840
II.—Nitrate of soda	2,020
III.—Sulphate of ammonia	1,700
IV.—Superphosphate	2,160
V.—Basic slag ...	1,820
VI.—No manure ...	1,780
VII.—Lime ...	1,620
VIII.—Sulphate of potash ...	1,900
IX.—Nitrate of soda and superphosphate	2,120

Plot VII. was spoilt by being choked with weeds; we must therefore ignore this plot. Taking plot VI. as representative of no manure and arranging the plots in ascending order we get the results

shown in the diagram, in which the cross-hatched columns represent green weight of crop at the time of cutting and the black columns the dried weight as hay.



It will be seen that remarkably little benefit was conferred by manuring cow-peas, and that even on this poor land, and without manure, what a valuable crop they are, more particularly when it is remembered that they matured sufficiently for hay in seventy-seven days from sowing, so that it would be easily possible to grow two, and in some districts three, crops in the summer, thus obtaining about three tons of excellent and most nutritious hay.*

Judging from these results, manuring of cowpeas would not pay, even on very poor soil.

An examination of the roots showed the presence of numerous nodules on plants from all the plots, so that doubtless they drew largely upon the air for the nitrogen they required.

* For composition of such hay see this *Journal*, vol. vi., p. 58 (October, 1907).

THE FORESTRY SECTION.

THE PROPAGATION OF TREES FROM SEED.

By C. E. Legat, B.Sc., Conservator of Forests.

To establish plantations of forest trees two main methods are employed. The seeds of the trees are either sown directly on the site where the plantation is to be formed or they are first of all treated in nurseries and the resulting seedlings or transplants are planted out on the land that it is intended to afforest.

It is very desirable to adopt the former plan whenever possible, for it is less expensive, and in a dry climate like ours there is this further advantage that the natural development of the root system is not in any way interfered with, so that it penetrates more deeply into the soil and the tree is thus enabled to draw on a larger underground space for moisture.

Unfortunately, at the present time the number of species of trees that can be so grown in the Transvaal is very limited. For *in situ*, or direct sowing, it is essential that seed should be obtainable in quantity cheaply, and that the species employed should produce seedlings of a nature hardy enough to brave the heat of a scorching sun or protracted periods of drought. On land infested with weeds, it is safer to use transplants, as on such sites direct sowings are liable to be choked out before the young trees can get established.

The kinds of trees most usually propagated from direct sowings in this Colony are wattles (*Ac. decurrens* varieties), oaks (*Quercus pedunculata*), cluster pine (*P. pinaster*), syringas (*Melia azedarach*) and, in the wetter districts, blackwoods (*Ac. melanoxylon*).

Eucalypt, cypress and callitris seeds are either too costly or the seedlings* are too delicate to permit of them being sown *in situ*, and the same remark applies to pines other than the cluster pine.

It will thus be seen that to propagate most species of trees planted in this country it is necessary to have recourse to nursery treatment, and, for the benefit of those farmers who reside too far from a railway station or a nursery to permit of them conveniently acquiring and transporting boxes of transplants to their farms or who cannot afford to purchase trees, I propose to give a few notes on raising transplants from seed.

* * * *

To raise transplants of sufficient size for setting out on the veld takes for most pines and cypresses a period of from nine to twelve months from seed, and for eucalypts, casuarinas, peppers, grevilleas, and plants of a similar rate of growth, from four to nine months, the lower limit applying to such rapid growing eucalypts as blue gum (*Euc. globulus*). Junipers (*Juniperus sp.*) and cedars (*Cedrus sp.*) are much slower, and quite two years must elapse from the time of sowing till they are fit to plant out. Thus, to ensure having a stock of transplants ready early in the planting

* It is well that readers should clearly distinguish between the terms "seedling" and "transplant." A tree is designated as a "seedling" even though it is twenty feet high till it is removed from the site or seed bed it was originally sown in and planted elsewhere, when it goes under the name "transplant."

season (which for evergreens runs from November to March) it is advisable to make autumn sowings (from February to March and beginning of April) for eucalypts, casuarinas, peppers, grevilleas, etc., and to prick out the seedlings before winter, carrying them through till spring as small transplants, and giving them shelter from frost and cold winds where necessary.

Very fast growing eucalypts such as the blue gum (*Euc. globulus*) and the manna gum (*Euc. viminalis*) can be sown in spring, say in September, and be quite big enough to plant out by the following January, but with most kinds, like the leather gum (*Euc. pauciflora* or *Euc. coriacea*) and the red ironbark (*Euc. sideroxylon*), there is the danger that the transplants raised from spring sowings will scarcely be big enough for use by February or March. This entails them being carried over till the following planting season, by which time they are pretty certain to be too large to handle satisfactorily and are apt to get potbound and unhealthy.

Pines and cypresses sown towards the end of March and pricked out before winter will be ready for use the following December or January, but if the trees are carried through the winter as seedlings, and pricking out is delayed till September, the transplants will be scarcely large enough before January or February, or about two months after those pricked out in autumn.

Spring (September) sowings also suit very well for conifers, as the seedlings can be pricked out in November or December and the transplants are a nice size to plant out permanently twelve months later.

It is undesirable to sow in the summer months if it can be avoided, as not only is it difficult to prevent loss of seedlings during torrential rainstorms, but there is great danger that "damping off" will occur on account of the moisture and heat then prevailing.

Some very perishable seeds, such as those of toon (*Cedrela toona*), ripen in summer. They are best sown immediately, but extra care has to be taken to overcome the troubles referred to.

In the low veld autumn sowings seem to answer best for most kinds of trees.

Deciduous trees with large seeds, like oaks, walnuts, chestnuts, should be sown in April. They will germinate and strike root, but will not throw up a shoot till spring. If acorns, chestnuts, etc., are planted earlier than this, the shoot they make will, in most parts of the Transvaal, get frosted, and the development of the tree will thus be impaired. Spring sowing is also satisfactory for these species, but there is a lot of trouble and difficulty involved in storing and handling such large seeds and in keeping them fresh during winter.

* * * *

The farmer intending to grow trees for planting on his property should select for his nursery a site where water is handy, and which is sheltered as much as possible from winds, especially from the cold south ones. The locality should be high lying, as in hollows difficulties from frost are likely to be encountered.

In this country experience has shown that by far the best results are obtained by raising seedlings and transplants of all evergreen trees, such as pines, cypresses, etc., in tins or boxes. It has been found that seedlings from boxes prick out much better than from the open ground, and that transplanting evergreen trees from nursery lines gives a much higher percentage of failure than from transplant boxes. This is due to the fact that

in the open ground the seedlings and transplants tend to develop their main roots rather than fibrous ones. In the process of moving them the large roots necessarily get broken, and the plants receive a severe shock from which they do not readily recover. The raising of transplants in beds requires much more skill than growing them in boxes, and inexperienced persons are better to avoid it when possible.

Seedlings are not so difficult to handle in that way, provided they are not allowed to remain in the beds after they have once reached a size large enough to permit of them being transplanted.

The kind of seed and transplant box most commonly used in this country is the ordinary five gallon paraffin tin cut in half lengthways, which forms two trays, the dimensions of which are approximately 13 inches long by 9 inches broad and 4½ inches deep. Boxes, either of wood or tin, of any convenient size to handle, will, however, serve the purpose, but the depth should be as near 4 inches to 4½ inches as possible.

Drainage should be provided for by knocking holes through the bottoms of the tins at regular intervals and by placing a layer of gravel, broken brick, sticks, or some similar material inside the tins before filling them up with some well-sifted light loamy soil. Avoid soil for seed tins that is likely to cake or "pack." Soil of this nature, if there is no other available, must be mixed with liberal quantities of coarse sand to make it more friable, as the use of heavy soil in the germination of seeds gives unsatisfactory results. Leaf mould mixed with the soil intended for seed tins greatly improves it, and unless the soil is naturally very rich, it is a good plan to incorporate some well decayed sifted stable manure with it in the proportion of about one part to six parts of soil.

The tins should be filled to within half an inch of the top with the previously moistened earth. Then the surface of the soil should be smoothed over and the seeds should be scattered broadcast and evenly over it. The quantity of seed to sow varies tremendously in the different species, and with the freshness and cleanness of each particular sample. However, as a guide in this matter, it may be said that seeds like pines should be sown so that they lie close together, but still quite clear of each other. Cypresses, as a rule, do not germinate very freely, and their seed may be sown rather more thickly so that they overlap, while one pound of eucalyptus seed should serve to sow between thirty to forty boxes of the size I have mentioned above.

Hard seeds, like those of wattles (*Ac. decurrens* var.), blackwoods (*Acacia melanoxylon*), gleditschia (*Gleditschia triacanthos*) and robinias ought to be soaked in water before planting till they are soft enough to cut with the thumb nail. The use of boiling water hastens the operation, and does not harm the seeds. After the boiling water is poured on the seeds, an immersion of twelve to twenty-four hours is usually sufficient, though, with old seed, a longer soaking is required to get them to the right condition.

Sometimes mice cause a lot of trouble by eating pine seed. When this is likely to occur, damp the seeds slightly and shake them up in a bag containing some red lead. A coat of the poison will be deposited on the seeds, and will tend to lessen the ravages of the pests.

After sowing, the seed should be pressed lightly into the soil by means of a flat board, and thereafter it should be covered to a depth of about twice its thickness with fine clean sand. Sometimes pine sawdust

is used for covering the seed, and it answers well, retaining moisture better than sand and never cracking, but seedlings are more apt to suffer from "damping off" when it is employed.

It should have been mentioned that the boxes should be placed on level ground, otherwise the soil and seeds are apt to be washed to one side or other in the process of watering and be wasted.

After sowing, the seeds should be watered through a fine rose and shading should be placed over the tins. The shading may consist of old sacks, hessian, or green branches of trees and shrubs, and should remain on till some time after germination takes place. Great care must be taken never to let the seed tins become dry. They must always be kept damp, but never wet. A watering once or twice a day will usually be found sufficient. If the seedlings get too much water artificially, or if wet, muggy weather prevails shortly after germination, "damping off" is likely to occur. This is a disease due to the presence of a fungus. The seedlings are observed falling over in patches, and their stems wilt just at ground level. If the disease is not checked, the patches rapidly increase in size till all the seedlings in the tin are lost. The disease is highly infectious, and, therefore, affected tins of seedlings should be removed from the neighbourhood of the healthy ones and either destroyed or they should be fully exposed to the sun and air, and be watered just enough to keep the seedlings alive. Watering is best done in the middle of the day. Sometimes an application of hot, dry sand will be found to stay the progress of the disease. The soil the diseased seedlings have grown in should not be used again for the germination of seed.

In warm, genial weather eucalypts will germinate in about ten days, pines in about three weeks, and cypresses in three to six weeks. The shading on the seedlings should be gradually reduced till they finally stand quite in the open. This "hardens them off" for the next stage they are to go through.

As soon as the side or secondary roots begin to appear on the tap root of the seedlings, which will be when they are about two to three inches high, they are ready to "prick out" or transplant. (See Plate 66.)

Exactly similar boxes are employed to hold the transplants as those used for raising the seedlings in. The soil may, however, with advantage be somewhat heavier, so that it may more effectually cling to the roots of the transplants when they are being set out in the field. At the same time it should not be so heavy as to "cake." Otherwise, the tins should be filled with soil in much the same way as for seedlings.

The pricking out or transplanting of the seedlings should be done in shade and during dull, cloudy weather. It is well to bear in mind that a moist atmosphere is most conducive to the success of this operation, and, therefore, if it can be performed shortly after rain has fallen so much the better.

The seedlings should be carefully removed from the seed trays so as to injure their side roots as little as possible, but no harm will be done if the main root is shortened a little. In fact this operation may be necessary in order to guard against the danger of the seedlings being planted out with the main root doubled up. Whenever this happens, the transplant almost invariably dies. Great care must be exercised to see that the main root is planted perpendicularly, and not crumpled up,

and the side roots should not be crushed. (See Plate 66c.) The roots of the seedlings ought not to be exposed more than is absolutely necessary during the operation of transplanting. If they once get dried up very unsatisfactory results may be expected.

The seedlings are simply "dibbled" into the transplant tins at regular distances apart, and they should be planted at the same depth as they stood in the seed tins. A reference to Plates 67*b* and 68*b* accompanying this article will give a good idea of the distance the transplants should stand apart in the tins, and how the rows are arranged. In a tray of the dimensions noted above, there is room for twenty-five transplants.

* * * *

After transplanting, the young trees must be well watered and kept in shade—either natural or artificial—till growth starts again, when they must be gradually accustomed to full exposure to the sun. Thereafter, till the trees are ready to be planted out on the veld, they will only need watering and occasional weeding. The tins should be examined every fortnight or three weeks, and if the roots are found to have grown through, they must be scraped off. Neglect of this precaution will lead to disappointment when the trees are planted out on the veld.

Opinions differ as to what size transplants in trays should attain before being transplanted out into plantations. Heights between six to twelve inches are the most favoured, and probably the sizes near the lower limit are best. (See Plates 67*c* and 68*c*.) Larger transplants are apt to get their roots very much interlocked, and when they are being removed with the trowel from the trays their roots suffer more than those of the smaller ones. They thus receive a severer check, and do not establish themselves so readily in their new position.

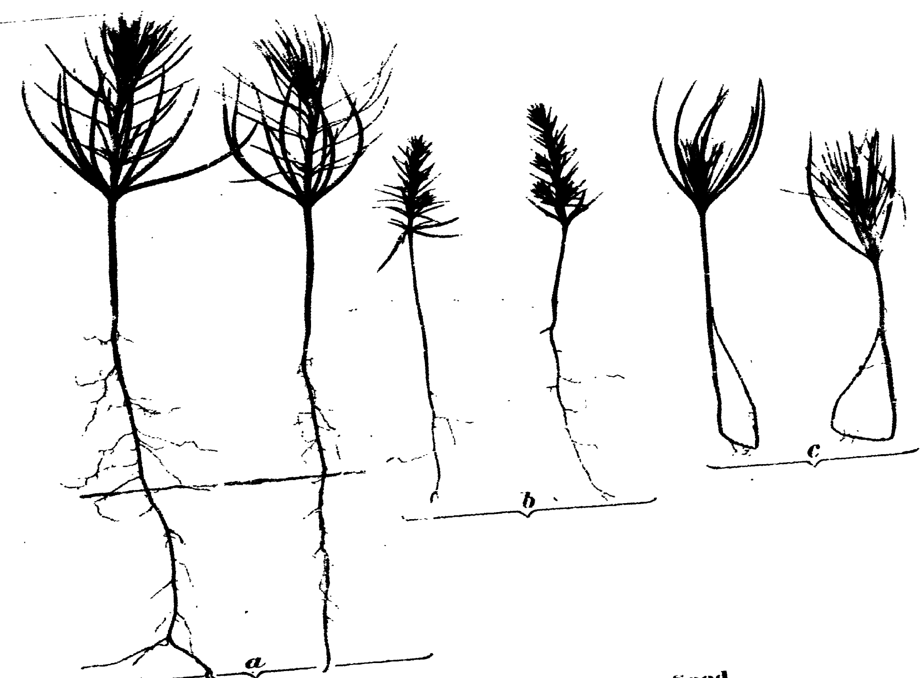
Planting out from the transplant trays should be done during and after heavy rains. Each young tree should be carefully cut out of the tray with a gardener's trowel, so that as much earth as possible adheres to the roots.

Before removing the tree from the tray a hole should be made with a trowel in the veld to receive it, and it should be planted so as to stand about one to two inches deeper than it originally stood in the tin. Unless planting is being done in the rain, the young tree will require to be watered to settle the earth about its roots, and if a favourable season has been chosen that should suffice to establish it permanently.

Many people living in remote localities, while they may wish to grow trees, may not be able to procure sufficient tins or boxes to rear the trees in. They will then have to raise them in the open ground. As mentioned above, this process is difficult, and though with care good results may be obtained, there is not the same certainty with open root transplants as there is in dealing with trees from trays.

The great point to aim at in growing seedlings or transplants in beds is to prevent the development of large main roots which, when broken or damaged, are likely to result in the death of the plant. Short fibrous roots are what are sought.

A convenient width for beds for seedlings is four feet. The soil in the bed should be thoroughly worked and brought to a fine tilth by digging and raking. If it is not of the light, loamy texture that is so



Raising of Trees from Seed.

Plate 66.

Seedlings of (*a*) Pines and (*b*) Cypresses at the stage for "pricking out" or transplanting. In this operation care must be taken that the roots of the seedlings are not doubled up as those of the Pines in (*c*). Long roots should be cut. In the case of the Pine seedlings (*a*) the portion of the roots below the line shown on the photo, should be removed before transplanting.

a b c

Plate 67.

Raising Trees from Seed.

(*a*) Cypresses in the seedling stage. (*b*) Cypresses newly "pricked out" or transplanted showing proper espacement.
(*c*) Cypresses of a suitable size for planting in the field.

NOTE.—The ends of the boxes have been cut and bent down to show the plants more clearly.

a *b* *c*

Plate 68.

Raising of Trees from Seed.

(*a*) Pines in the seedling stage. (*b*) Pines newly "pricked out" or transplanted showing proper espacement.
(*c*) Pines of a suitable size for planting out in the field.

NOTE.—The ends of the boxes have been cut and bent down to show the plants more clearly.

desirable, two or three inches of top dressing composed of sand, leaf mould, well decayed manure and earth may be sifted over it, and the whole bed should be levelled. The bed should stand a few inches above the surface of the surrounding ground, and the sides should be protected with bricks or spars to prevent the soil being washed away and to provide drainage. The seeds should then be sown in the same way as was described above for sowing seeds in tins. As before, shading will be required till germination takes place.

Pricking out should be done when the young trees are quite small, and as soon as the side roots appear and before the tap root becomes too strongly developed. If, unfortunately, owing to pressure of other work, this "pricking out" or transplanting cannot be attended to, the growth of the tap roots must from time to time be checked by inserting a knife slantwise beneath the young trees and cutting the roots about three inches below the ground. This will cause the trees to develop side roots and prevent them making soft sappy shoots. Growing the seedlings in lines six inches apart rather than broadcast greatly facilitates this operation, and is the best method to follow when there is any chance of delay occurring in pricking out.

The seedlings are transplanted into nursery lines and are spaced 6 in. by 6 in. to 6in. by 12 in. apart. The transplanting should be done in dull, cool weather if possible, and shades made of sacking, hessian or branches put over the trees till they once more get established. As the material is so small, the actual transplanting is best done with a dibbler or pointed stick, as in the case of raising trees in tins, though the trowel and spade are sometimes employed.

After the transplants are once established in nursery lines, constant care and watchfulness are necessary to prevent too rapid growth of root and shoot, and once a month or oftener during strong growing weather the roots should be cut with a knife a few inches below the ground.

Another way of promoting the growth of short fibrous roots is to raise the transplants slightly out of the ground with a fork at frequent intervals. This breaks the large roots without interfering with the development of the smaller ones. Growing trees in beds succeeds better with pines and cypresses than with eucalypts, the roots of which on account of the rapidity of growth of the genus, are difficult to keep in check in the open ground.

In some respects it would be best to move evergreen trees from the open ground in winter when they are dormant, but against this there is the fact that if any considerable number of trees are to be planted, a lot of time and trouble would have to be expended in keeping them watered until the commencement of the rains.

Planting from open beds is therefore mostly done in the usual planting season for evergreens (November to March), and it is better to use transplants nearer six than twelve inches high, as they stand moving better.

In taking trees out of nursery lines for planting out, as much earth as possible should be lifted with the roots, and the transference of the trees to their permanent site should be carried out expeditiously. The trees can be conveniently carried to the scene of planting operations packed closely together in plant trays or boxes. This will tend to prevent the earth falling off the roots and keep them moist.

In spite of all precautions, however, the earth will sometimes fall away from the roots of some trees. These trees should have their roots immediately puddled in a paste made of a mixture of mud and cow dung, and they should be planted with as little delay as possible. In transferring such trees to the scene of planting operations their roots should be covered up with moist sacking, moss or soil. Every endeavour should be made to carry out planting from open beds during rainy weather, as this will greatly improve the chances of success.

If it is found at planting time that eucalypts, casuarinas, grevilleas, peppers, or such like species have, in spite of all precautions, shot up and grown rather rank it is advisable before moving them to cut them back, removing all sappy growth and the greater portion of their foliage. By doing so evaporation from the plants will be reduced till root action is again fully restored, and they will thus have a better opportunity of establishing themselves. This method should not be used for pines, cypresses or conifers generally.

Deciduous trees, that is trees that are leafless in winter, are transplanted and planted out permanently in that season. They are then dormant and are therefore handled without any difficulty. They can be lifted out of the ground, have the earth removed from their roots, and be transported great distances without receiving any hurt. Care should of course be taken at the same time that the roots are never allowed to get dry or be exposed to the sun and air for any appreciable length of time, as such exposure may lead to the death of the trees or, at any rate, to indifferent success.

It is quite unnecessary to grow deciduous trees in tins, unless it is desired to plant them "out of season" during the summer.

* * * *

Deciduous trees most commonly propagated in this country are oaks (*Quercus sp.*), planes (*Platanus sp.*), robinias (*Robinia*), ash (*Fraxinus sp.*), alders (*Alnus*), elms (*Ulmus sp.*), walnuts (*Juglans sp.*), sweet chestnuts (*Castanea*), poplars (*Populus sp.*), and willows (*Salix sp.*).

The last two are almost invariably grown from cuttings. Planes are raised from cuttings and seed, robinias and elms from seed and root suckers, oak, ash, walnut and sweet chestnut from seed alone.

Deciduous species that have large seeds like oaks, walnuts, chestnuts, etc., should have the seeds sown in rows about a foot apart; seeds of other species which are small, like those of ash, alder, birch and plane, are best broadcasted. The fine seeds of the last three are mostly easily germinated under cover of a layer of thick blotting paper which is kept constantly moist. When deciduous seedlings are about twelve months old they should be transplanted into nursery lines and may be spaced twelve inches in the lines and twenty-four inches between them. When two years old from seed most deciduous species are large enough to plant out into their permanent situation, but if larger saplings are required they may remain another year in the nursery lines without being moved. If the trees are then still not big enough they must be transplanted in the nursery again and be spaced slightly further apart, say in rows 2 feet apart, with an interval of 2 feet between the plants in the rows.

This transplanting is required to stimulate the growth of fibrous roots, in the absence of which trees do not "take" so well when they are finally planted out.

The soil of seed beds and nursery lines should always be kept well cultivated and free from weeds, and it is generally well to add some good rotten manure to both the seed beds and ground intended for nursery lines before a start is made with sowing or planting.

Saplings four to six feet high are a useful size for general purposes in permanent planting of deciduous trees, though for street use larger ones are often preferred. In removing saplings from nursery lines, care must be exercised to lift them with the roots as far as possible intact. The pits prepared for them should be of ample size to contain the root system without crushing, and if the ground has not been previously worked by ploughing and cultivating, pits of large dimensions, say three feet cube, will be necessary. After being moved into their permanent positions, deciduous trees need watering right up till the time the rains commence.

THE BOTANICAL SECTION.

No. 1.—ADDITIONAL USES OF THE MAIZE CROP.

By Joseph Burtt-Davy, F.L.S., Government Botanist.

Public atention has recently been drawn to the question of establishing local industries. Many difficulties present themselves owing to cost of labour, cost of living, distance from the coast, relative scarcity of water, etc., etc. With some industries there is little doubt that enterprise and ingenuity will overcome all obstacles, but other cases are more problematical. With so much to handicap manufacturing enterprises, their success must depend on the raw materials being available at the lowest possible figure. It is evident, therefore, that—other things being equal—whenever suitable by-products from some established industry or farm crop are available, it is advantageous to use them instead of growing special crops for the purpose.

Maize or "mealies" being one of the staple crops of the Transvaal, it has seemed desirable at the present time to call attention to some of the principal uses which can be made of its by-products. It rests with the manufacturer and man of business to decide whether the crop can be utilised in South Africa for all or any of these purposes.

For Stock-Feeding.

In the Transvaal, where winter feed for stock is such an important item, the first consideration should be given to the use of maize products for stock feeding. The United States of America produced in the year 1905 758,238,320 muids of maize grain, apart from that eaten as "green mealies." Most of this enormous production, as well as of the dried stalks and leaves, or "stover" as it is there called, is fed to stock. Not more, usually only one-thirtieth, and often only one-fiftieth, is exported. Part is manufactured locally.

Maize grain is growing in favour as an article of stock food. It has long been used in Europe and America for horses and cattle; many Transvaal farmers are now feeding it to sheep as an addition to the silage made from the maize stalks and leaves.

If the maize is cut before the grain is dead ripe, while there is still a little moisture and greenness in the stems and leaves, and stacked in the field to ripen off, it makes excellent hay, and the grain does not suffer. Even the dead-ripe and dry stalks make good winter feed, but there is far more waste in this form than if cut a little earlier.

For Human Food.

"*Canned Corn.*"—In America a small proportion of "green maize" ears is tinned for export under the name of canned corn. In some States large canning factories are established, which every season put up thousands of tins of "green corn" cut from the cob ready to be cooked and eaten when the fresh article is out of season. "Canned corn" is a staple vegetable during the winter months. There seems to be no reason why it should not be prepared in the same way in the Transvaal for local use; it is desirable, however, to grow "sugar corns" for this purpose, not the ordinary hard flint or dent maize usually grown in this country.

Corn-flour.—Maize is also used very largely for the manufacture of "corn-flour," which is sold separately for the preparation of puddings. It is sometimes mixed with wheat flour, the mixture being sold at a considerably lower figure than the all-wheat flour; but the laws of many States prevent the sale of this compound under the name of wheat flour, and require that the fact of its being a mixture must be clearly designated; this action naturally tends to reduce the sale.

The use of "hominy," "samp," "corn-meal," "corn-flour," "corn-starch," and various fancy forms of ground maize, which are put up with attractive names as breakfast foods and pudding ingredients, is extending constantly, not only in the United States but also in Europe. It has been suggested locally that South African mealie meal should be introduced on the European markets, but unless it is prepared with greater care than is usually the case, it could not be expected to compete with the daintily-prepared American articles. There seems no reason why the local use of this wholesome food should not be greatly increased. That a large number of dainty articles of diet can be prepared from maize is shown by the number of tested recipes given in the *Farmers' Bulletin* recently issued by this Department.

Arts and Manufactures.

Starch.—The manufacture of starch has become an extensive industry in the United States, and maize is now one of the chief sources of supply. The total output of the grain-starch factories had a value of over 8,000,000 dollars in the census year 1900; of this amount 6,900,000 dollars was for starch, and 1,100,000 dollars for starch by-products.

Glucose is extensively prepared from maize. It is made in various degrees of density, each of which is designed for a specific purpose; the principal use is said to be as a "filler" (or adulterant) in the manufacture of table syrups and confectionery. "Corn-syrup" is being extensively used for table purposes in place of golden-syrup and molasses.

Dextrine and various forms of gum used in sizing cloth and as mordants or mediums for carrying colours in cloth and calico-printing have a wide use, and are largely prepared from maize-starch.

Corn-oil is a by-product obtained by crushing the "germ" of the maize, which has been previously removed from the grain, by mechanical means, in the preparation of other products. The oil is clear and tasteless, and serves admirably as a "filler" for olive oil, and, to some extent also, for certain animal oils. Being a by-product it is relatively cheap, and therefore has a wide range of uses.

Rubber-fillers.—By vulcanising corn-oil, a large New York firm is now manufacturing a substance which appears to be a satisfactory "filler" for india-rubber. The material is said to lack some of the characteristics of real rubber, but it can be mixed with certain proportions of the latter in the manufacture of articles where great elasticity is not called for. It is sometimes called a "rubber substitute," but the term is misleading, and it can only be used satisfactorily in connection with the real article.

Oil-cake, oil-cake meal, and various other cattle foods such as gluten-food, etc., are also among the by-products of the starch and glucose factories.

A Philadelphia firm is now proposing to use the dry leaves, husks, and outsides of the stalks of the maize plant to mix with ox-blood, molasses, meals and chopped meat for poultry and stock-food.

Celulose is prepared in Philadelphia from the pith found inside the maize stalk. It is used in the manufacture of smokeless powder, as well as in the preparation of a "Pyroxylin varnish." There is also a limited demand for maize for use at the dynamite factories.

Whisky is largely prepared from maize in the United States. During the year 1900, maize to the value of 5,968,198 dollars was used in the manufacture of distilled liquors (whisky, alcohol, Cologne-spirit, etc). This is about 68 per cent. of the total quantity of grain of all kinds so used in the United States.

Maize Husks.—The thin, papery husk surrounding the maize cob makes excellent filling for mattresses, and is largely used for this purpose in the United States. It also makes very durable and artistic door-mats, some excellent samples of which have been manufactured in the Zoutpansberg under the direction of the Education Department. The same material is used in the preparation of ladies' hats.

Paper Material.—The husks are also used extensively in Southern Europe and the United States for the manufacture of a paper which is remarkably tough and lacks the brittleness of straw papers. The question of the possible manufacture in the Transvaal of paper from maize-husks has been investigated, and resolves itself into whether we can produce it at the price of the imported article, viz., about £16 10s. per ton. This would depend largely on the cost of erection and maintenance of plant and of the necessary chemicals employed, much of which would have to be imported. The problem is chiefly an economic and commercial one, and the Imperial Institute, when consulted on the subject, advised that "a careful survey, by a practical expert, of the local conditions and the cost of manufacture would be necessary before a decision could be arrived at." The question is discussed at length in the *Agricultural Journal*, Vol. IV., pp. 366 and 611.

The latest American use of maize-stover, trash, cobs, and other waste material, which has come to our notice, is the manufacture of illuminating gas. A plant for the purpose, established at Beatrice, Nebraska, in June, 1907, is selling the gas at one dollar for 1,000 feet of gas, which is seven dollars less per 1,000 feet than the price charged for coal gas by a company in the same city. It should be pointed out, however, that in Nebraska coal is exceptionally expensive, on account of long haulage.

No. 2.—OIL-SEEDS FOR THE TRANSVAAL.

By Joseph Burtt-Davy, F.L.S., Government Botanist.

The question of an adequate supply of locally grown oil-seed for use in the manufacture of oils, soap and candles is attracting a good deal of attention, and a few notes on the kinds suitable for cultivation in the Transvaal may be of interest at the present time.

Castor-Oil.

The last three seasons have shown that the castor-oil bush is too sensitive to frost to be a safe crop for commercial cultivation much above the 2,500 feet level. There are a few warm sheltered places above this altitude where it can doubtless be grown, but even at the foot of the hills near Warmbaths the crops have been destroyed by frost. It undoubtedly does best and gives best returns in the low veld. Some Natal farmers are now pushing the cultivation of this crop along the coast.

There is a good demand for the oil, but local mills have not been able to secure sufficient seed. This Department has tried to stimulate the cultivation of the crop by frequent notes and articles in the *Journal* and by the free distribution of seed of better-yielding varieties. Much of the seed distributed has gone to the bush-veld, between 3,000 and 4,000 feet altitude, and owing to the severity of the last three winters most of the plants have been killed outright before good crops could be secured. This has discouraged the farmers in those districts. As an instance we may quote a farmer on the slopes of Modjajes Mountain, near Devilskloof, Eastern Zoutpansberg, at an altitude of about 4,000 feet. We supplied him with seed for an acre plot, which was sown October, 1906. He reports that although the plant grows well there he now considers that the altitude is too high, and that a better return could be obtained 1,000 feet lower ; "at present we cannot see that we can get a decent return per acre, and when the distance from a station is borne in mind, we do not consider the crop a payable one."

At this altitude it suffers from a leaf-rust [*Uredo ricini* (Biv.) Bernh.], and in some seasons from the ravages of a caterpillar (*Ophiusa catella*), which sometimes defoliates acres of the crop. At and below 2,500 feet altitude, however, good crops of castor-beans can be grown, and it is possible that at that altitude the growth of the plant will be so vigorous that it will be more resistant to the ravages both of the fungus and the caterpillar.

As the localities near the existing mills are unsuited to the cultivation of this crop on an extensive scale, it is important that the site selected for its cultivation should be within easy distance of the railway, or that a factory should be established in a part of the country suited to the cultivation of the crop.

Owing to its poisonous character, the residue is not suited for stock-feeding, but it may be used for manuring the land.

Further information may be found by reference to earlier numbers of this *Journal*, particularly Vol. III., No. 10, pp. 271-280 ; No. 11, pp. 569-570 and 610-613 ; No. 12, pp. 732 and 864. Vol. IV., No. 13, p. 207 : No. 14, pp. 372-377, 377-379, 379-380 ; No. 15, pp. 619-623, 688-689, 916. Also in the Annual Report of this Department, 1904-05, pp. 264-266 and 311-312.

Sunflower Seed.

This crop is so well adapted to the climatic conditions of the Transvaal, and is so easily grown, that it is one of the most promising oil-seed crops to take up from the purely cultural point of view.

The "cake" obtained from the seed, after crushing, forms a valuable cattle food, having a high nutritive value, pronounced by American agricultural chemists to be quite equal to that possessed by linseed and cotton-seed cakes.

As a paint oil, the oil will not displace dark boiled linseed oil, but for light colours it is said to be vastly superior to the finest light boiled linseed oil. It is considered a satisfactory drying oil, and has the distinct advantage of not turning yellow on drying, which is a great defect of even the best linseed oils, spoiling the delicate tints of very light coloured paints. A manufacturer engaged in the oil and paint trade in Europe writes within the last few months :—"We now send all white lead ground in prepared sunflower oil, and having done so for some time past have received the commendation of our customers to our great satisfaction. . . . The oil appears to be practically unknown in England, and I have not found any quotation for it, but its value is about £20 per ton of oil. It is a tricky oil to refine, going red under the slightest provocation, but, as you are aware, two years ago I worked out a new process, and have just sent samples to England, and a trial consignment of a ton, which I hope will lead to a direct trade in the oil as such."

The hot-pressed oil is also used for soap-making, but is not as suitable for this purpose as some other oils.

As an edible oil, sunflower oil is very palatable, and makes, without refining, an excellent salad dressing. The same correspondent above referred to writes :—"Sunflower seed oil is an uncommonly good one, but very little known outside of Russia. The cold drawn and finer qualities of hot-pressed oils make such an excellent culinary article that even my anti-oleaginous taste enjoys a spoonful cooked with the morning porridge. If your natives are at all oil-eaters they should revel in the lowest grades." It has been suggested that sunflower oil might be mixed with crushed maize cobs for winter feed for stock.

Pea-Nuts or Ground-Nuts for Oil.

Our experiments with this plant have given thoroughly satisfactory results in the right soils and climate. The crop is well-adapted to the light sandy soils of parts of the Waterberg District, especially near Warmbaths, Nylstroom, and Potgieter. The oil is particularly valuable for soap, and there is some demand for the "nuts" for food purposes.

Cotton-Seed Oil.

One of the most important commercial and manufacturing oils is that obtained from cotton-seed. Now that the cotton industry is in a fair way to become established in the Transvaal, the use of the valuable oil should be taken into consideration. The only hindrance to its immediate use is that there is in the Transvaal no machine for removing the fuzz from the seed-coat after ginning, and it is essential that this should be removed before crushing. Cotton-seed oil is one of the principal oils used in soap-making ; it is also used as a substitute for, and adulterant of, olive oil.

As a concentrated cattle-food, *cotton-seed meal* ranks among the richest in protein ; it also makes an admirable fertilizer. In the United States the meal is sold by the mills to the farmer or exchanged for seed on the basis of one ton of meal for two tons of seed. *Cotton seed-hulls* are also largely sought after in the States for feeding stock.

Plate 69.

Cotton Selection Plots

At the Botanical Experiment Station, Pretoria.

Plate 70.

Cassava Plants

At the Botanical Experiment Station, Pretoria.

The roots are used as winter feed for stock in the Low Veld.

Plate 71.

Velvet Bean.

(*Mucuna utilis.*)

Grown on the high veld at Witbank, by Mr. L. Knapman, Manager, Witbank Colliery Farm.

Plate 72.

Teff Grass Pasturage for Dairy Cows.

Grown by Mr. L. Knapman, Manager, Witbank Colliery Farm.

LINSEED.

Our first experiments with this crop at Skinner's Court were not entirely successful owing to the injurious effect of a wilt-disease, probably of bacterial origin, and similar in its effects to that which has done so much damage to this crop in the Dakotas. On the other land, however, we have had better results. Several farmers have produced small samples of fine quality on the high veld.

Flax is a very exhausting crop on the soil, which requires thorough tillage and careful preparation. The crop calls for good cultivation, and it is not likely that any but trained farmers will be able to grow it successfully.

NATIVE OIL SEEDS.

Maramaas, the seeds of a native species of Bauhinia, have been mentioned in this connection, but so far they have not given very satisfactory results. The plant is not widely distributed, and does not seem to be plentiful.

Maawa Seeds.—There is some demand in Europe for the seed of the Maawa or Rooi Esschenhout (*Trichilia emetica*), which grows in the Zoutpansberg. The Imperial Institute reports that large quantities of the seeds under the name of "Mafoureira nuts" are now exported from Portuguese East Africa to Marseilles, where the oil is expressed for soap-making. The price paid at Marseilles is stated to have been £8 per ton in 1900, and recently an offer of £9 5s. per ton has been made for these seeds in England. The Director of the Imperial Institute adds:—"If the seeds are obtainable in quantity in the Transvaal, there is little doubt that a market could be found for them either in this country or on the Continent." An article on the subject appeared in the Bulletin of the Imperial Institute, Vol. 1, pp. 26-29, May 21, 1903.

Trichilia emetica extends through tropical Africa to Arabia. In Arabia, where it is known as "Roka," the women are said to mix the fruits with the perfume used for washing their hair; the ripe seeds are made into an ointment with sesamum oil and used as a remedy for the "itch."

In December, 1858, Dr. (afterwards Sir) John Kirk collected specimens of *Trichilia emetica* at Lupata, on the banks of the Zambesi, and observes in his field notes that it was there called "Motsakin," and was known to the natives as yielding an oil. He adds: "The native name, Mafura, means *fat*, and it is applied to many different oil-seeds. The oil of this species, under the name of 'Mafura,' is said to be shipped from Inhambane. It is used by natives in cooking."

A Zoutpansberg correspondent writes that the harvest time for the seeds is "from June till September, and it is only after the rains have set in that the harvest can be said to be over."

Mr. E. M. Holmes, F.L.S., Curator of the Museum of the Pharmaceutical Society, quoting from De Negri and Fabris, states that the high melting point of the commercial article known as Mafura tallow renders it especially suitable for the manufacture of soaps and candles.

JATROPHA OIL.

The physic-nut plant, *Jatropha curcas* (Plate) thrives in the Eastern Transvaal at and below 2,500 feet altitude, and is now naturalised at the foot of the Lulu Mountains, Lydenburg District, and in the Spelonken, probably from seeds brought from tropical Africa by the natives, who use them medicinally.

The seeds yield a pale-coloured fixed oil described in the *American Journal of Pharmacy* (1893, p. 335) as without smell or colour when fresh, but becoming yellowish and slightly odorous with time. When cold it deposits a white substance, which is probably palmitin; alcohol does not readily dissolve it. The specific gravity is 0.91 at 19° C.; it solidifies to buttery consistence at 8° C. It is now considered to be a mixture of palmitin and myristin.

Under the name of Purgueira the seed has been exported from the Cape de Verde Islands to Portugal to the extent of about 350,000 bushels a year, there being several oil mills which make use of it. The seeds are slightly roasted and crushed, when the shells can be easily removed and the oil is then expressed. According to Cornevin, 1,000 lbs. of seeds yield 640 lbs. of kernel, which furnishes about 260 lbs. of oil. From Portugal the oil is said to be sent to France for the manufacture of transparent soap. The oil has been imported into England under the name of seed oil, and used as a substitute for linseed oil, as well as for dressing cloth, burning in lamps, etc.

No. 3.—THE HARVESTING OF PEA-NUTS (*Arachis hypogaea*).

BY JOSEPH BURTT-DAVY, F.L.S., Government Botanist.

The principal drawback to the growing of pea-nuts in this country is the labour and expense involved in harvesting. But as this crop is grown extensively in the United States, where farm labour is neither plentiful nor cheap, we may find that by studying the American method of treatment means may be devised to overcome the difficulty which will suit local conditions.

The following information on the subject is given by Mr. R. B. Handy in the *Farmers' Bulletin*, No. 25, of the United States Department of Agriculture.

The nuts should be out of the ground before the first frost, as it is injurious both to the vines, when regarded as fodder, and to the kernels. It may be necessary to dig the crop some time before frost is feared, because early formed nuts when frost is long delayed begin to sprout in wet weather, and the loss to the farmer from that cause would be greater than the gain from the maturing of the later nuts. Besides, if pea-nuts have been cultivated in the same land for several years the vines will drop their leaves and are thus greatly injured for use as hay.

Pea-nut farmers have a plough made especially for harvesting this crop, which has no mouldboard and has a bar 3 feet long and an upright the same as other ploughs. The foot piece is welded 12 inches from the rear end and extends up to 5 inches, with a small hole through it, to which is fastened

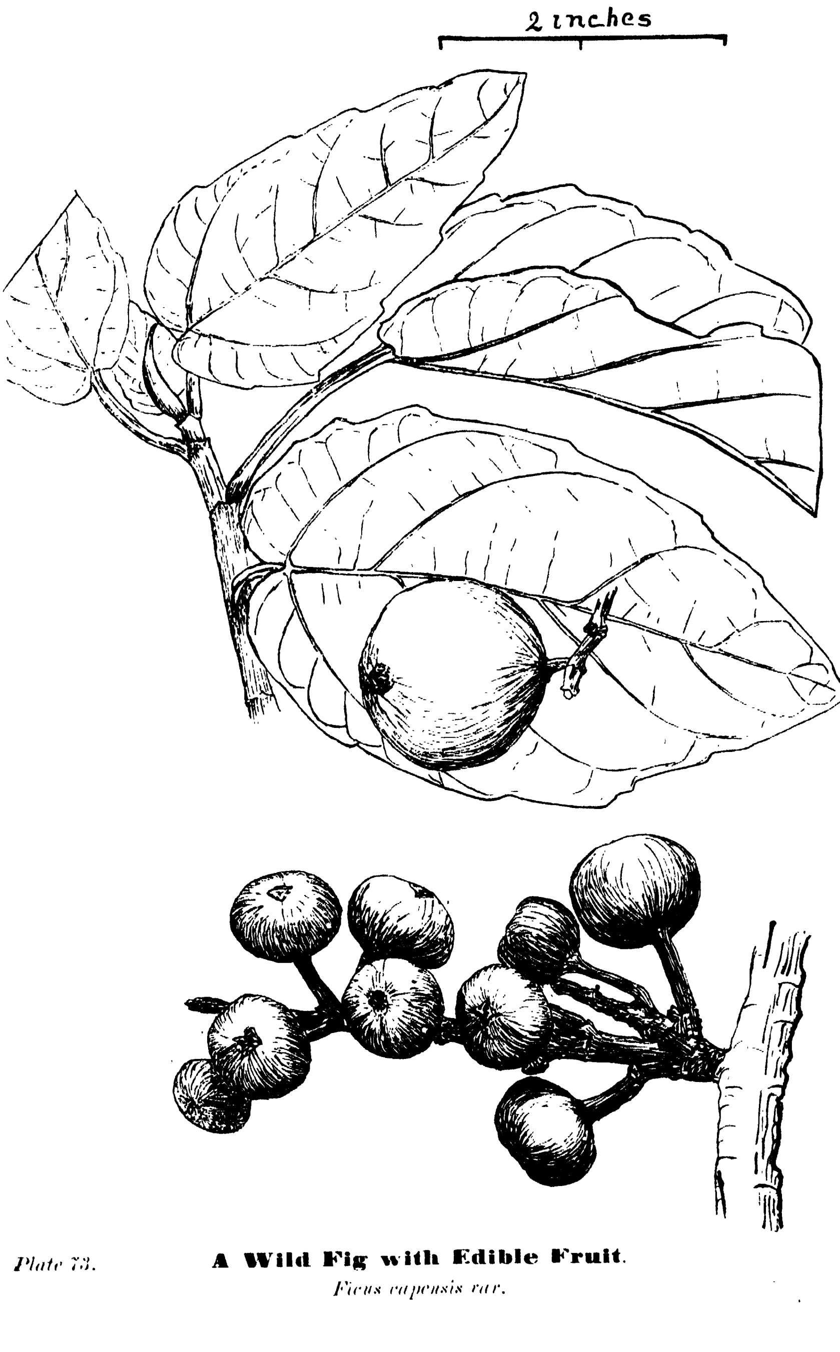


Plate 73. **A Wild Fig with Edible Fruit.**

Ficus capensis var.

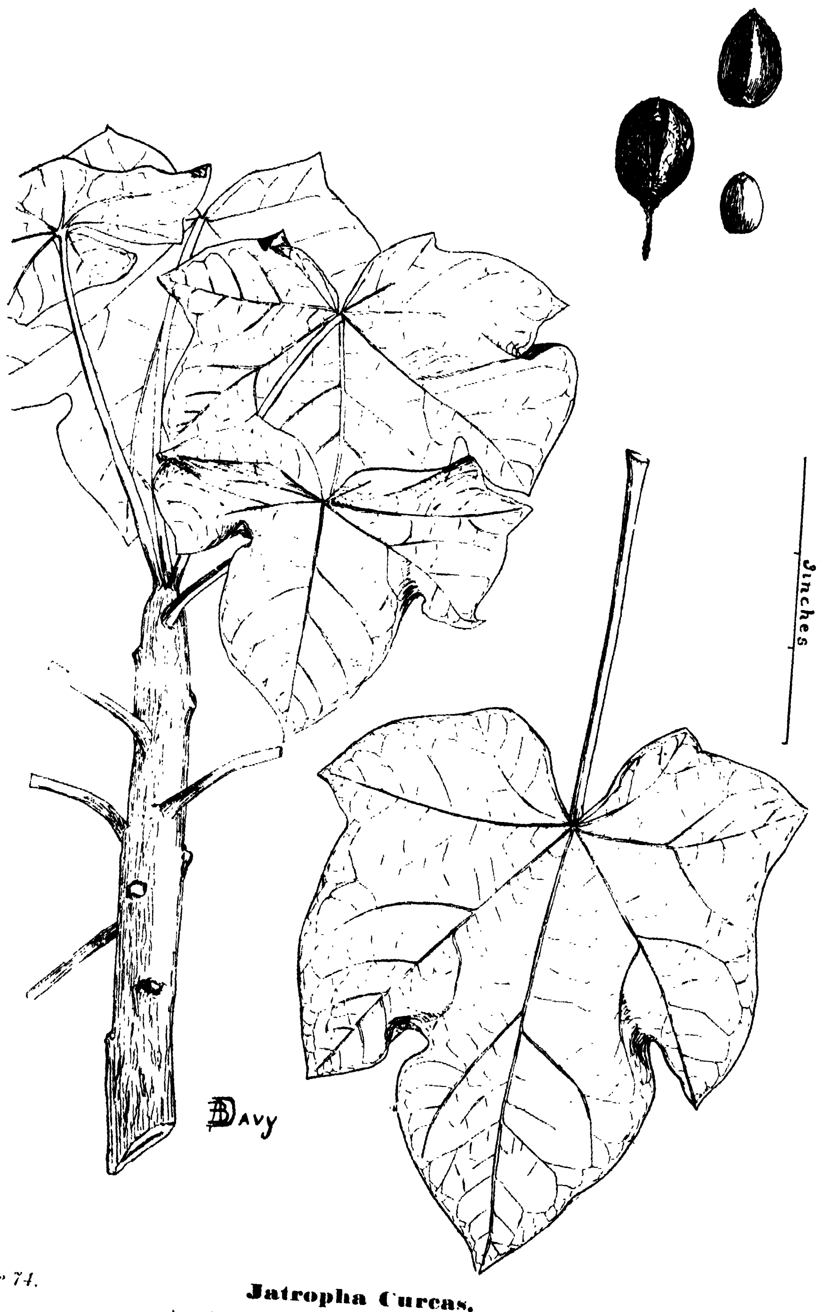


Plate 74.

Jatropha Curcas.

A poisonous oil-seed new to the Transvaal.

the hind helve of the plough. The beam is as usual, with handles fastened to either side of it. There is a duck bill on the flat end of the bar and a sword 4 inches wide and 16 inches long welded to the bar 5 inches behind the duck bill and extending out to the right side diagonally and backward so as to run under and cut the taproot of the vine.

This plough, with two horses attached, is passed up each side of the row deep enough to escape the nuts, the long wing cutting the taproots, rendering them easy to remove from the soil. Following this plough labourers with pitchforks remove the plants from the ground, carefully shaking off all loose soil, and piling them in windrows three rows in one. They are usually ploughed in the morning, and then in the afternoon are stacked or shocked around poles 7 feet high, set in the ground in convenient places in the field. In shocking care is taken to keep the vines from the ground, the usual practice being to lay a couple of fence logs on each side of the centre pole, and the plants are so arranged around the pole as to have the pods inside, and also to leave some space next to the pole for the circulation of air. The shocks are usually capped with maize fodder or hay to keep out the rain.

After being thus stacked from fifteen to twenty days the pods are ready to be picked. This operation is usually performed by women and children, who are paid so much per bushel, and are expected to pick only the mature and sound pods. It is slow and tedious work, and one of the largest items of expense to the pea-nut farmer. Some farmers leave their nuts unpicked until spring, but this subjects them to the depredations of birds and animals, many of which readily eat either the nuts or the vines.

In the Wilmington section there is some variation from the above in the method of harvesting the crop. The vines after being allowed to remain in the ground two days after ploughing are then pulled out and shaken free from soil and stacked around poles 12 to 14 feet high, where they are allowed to remain about a week or ten days and are then removed to large barns and stored away like clover hay until it is convenient for the planter to have his nuts picked. The Wilmington pea-nut being much smaller than the Virginia or Tennessee nut, and also more completely filling the shell, is not so easily injured as the larger varieties, and thus can be picked by machinery of the general nature of a thrashing machine. Some dealers object to machine-picked nuts, but the experience of those who follow that practice in harvesting their crops shows but little if any difference in the price of hand or machine detached pods of the North Carolina variety, and what difference there may be in price is offset by the saving in cost and the rapidity with which they can be put upon the market at any desired time. Besides, it is claimed that the hay, after passing through the picker or thrashing machine is in better condition for fodder than the hay from the hand-gathered pea-nuts. After the pea-nuts are picked they should be cleaned before being sacked.

The average yield in the States varies from 20 to 60 bushels, more usually 50 to 60 bushels per acre. 100 bushels is not an uncommon yield. The legal bushel in America is 22 lbs. weight. At Warmbaths, Mr. Quarry has harvested 273 bushels from three acres, an average of 91 bushels per acre.

No. 4.—FIBRE-PLANTS OF THE TRANSVAAL.

Cow's Tongue, *Sansevieria grandis.*

By Joseph Burtt-Davy, F.L.S., Government Botanist.

A good deal has been said and written lately about the possibility of developing local industries, especially with native plants. Our attention has recently been drawn to a strong leaf-fibre of the Low veld, which proved to have been derived from a species of *Sansevieria* of the family *Liliaceae*. Other species of the genus, such as *S. guineensis* and *S. sulcata*, have long been known to produce useful fibres.

The species in question, of which only leaves were submitted, did not entirely agree with the descriptions of species in the *Flora Capensis* or *Flora of Tropical Africa*, and more complete material was asked for.

During my absence in America, specimens were submitted to the Royal Botanic Gardens, Kew, by Mr. H. L. Hall, of Nelspruit, where they were identified with a species only previously known to occur in Cuba, *Sansevieria grandis*, Hook. f.

The following note on the subject has been published in the *Kew Bulletin*, 1908, No. 1, p. 371 :—

Sansevieria grandis.

A specimen of fibre has recently been submitted to Kew for determination and for a report as to its commercial value. It was accompanied by a few leaves, which were sufficient to identify it as *Sansevieria grandis*, Hook. f. The sender, Mr. H. L. Hall, general merchant, etc., of "Riverside," Nelspruit, Transvaal, describes the plant as growing plentifully there, and remarks that the fibre sent was made up by the natives some time ago, but "as it is now winter and the dry season" (date of letter 3rd August, 1907), the fibre in the leaf "is not as good as when gathered in the summer." Thus the uncertainty as to the native country of this species (cf. *Botanical Magazine*, t. 7877, 1903, which is quoted below) is now removed, and one locality, at least, defined.

Nelspruit is situated approximately in 25° 30′ S. lat. and 31° E. long., in the Barberton District of the Transvaal, so that the original source of *S. grandis* may now be regarded as Sub-tropical Africa, although it is still possible that it may exist in some of the neighbouring tropical areas. This is by no means unlikely when the cosmopolitan character of some of the species of *Sansevieria* in Africa is considered, and also the readiness with which the plant under consideration may be propagated.

The plant appears to be well established—if not wholly naturalized—in Cuba, and it is a matter of some uncertainty as to how it got there. It may be worthy of note that the Portuguese settlements in Africa were closely associated with Cuba in the early days of its colonization by the Spaniards (from 1511 onwards). As the Spaniards increased in numbers the conquered West Indian aborigines, whom they employed, died out with extraordinary rapidity, and the introduction of the stronger African negroes was proposed to take their place at the mines and on the sugar plantations; King Charles of Spain, in 1577, authorising their importation from the Portuguese African settlements. It is within the bounds of possibility that the company to whom the introduction is attributed found the plant already there.

Plate 75.

Natal or Egyptian Kweek-gras.

(Dactyloctenium aegyptium.)

Plate 76.

A Useful Native Hay-grass.

Setaria aurea.

Sansevieria grandis was first described in the *Botanical Magazine*, and Sir Joseph Hooker's account is reproduced here. This, together with the information supplied by Mr. Hall, will give the sum of all that appears to be known about this plant up to the present time.

"Stem, a stout Iris-like rhizome. Leaves, few, very large, rosulate, sessile, unequal-sized, the largest three to four feet long by six inches or more broad, spreading, obovate-oblong, acute or mucronate, rigidly coriaceous, flat, dull green, crossed by broad bands of much darker green on both surfaces, margin with a very narrow, red-brown, cartilaginous border. Scape about two feet high, stout, green, bearing a few distant, narrow, lanceolate sheaths. Panicle two to three feet high, erect, narrow, spiciform, dense-flowered. Bracts minute, ovate, acuminate, scarious, three-flowered. Flowers sessile, or very shortly pedicelled, erect, about two inches long, pure white. Perianth-tube cylindric, inflated at the base; segments about as long as the tube, linear sub-acute, dorsally costate. Stamens as long as the perianth segments. Anthers linear-oblong. Style slender, stigma minute, capitate.

"This very noble species of 'Bowstring Hemp' was presented to the Royal Gardens, Kew, in 1896, by the Royal Botanic Society, Regent's Park, who received it from Dr. Heath, F.L.S., of Ebury Street, London. Referring to that gentleman, he told me that roots of it were given to him by a Cuban merchant, who informed him that the plants had been introduced into Cuba by a company formed to grow it for its fibre, and that the company had failed, owing to the cultivation of the plant not having been carried out in a practical manner. The fibre, he adds, is fine, white, silky, and is of extraordinary strength, far exceeding any other, a few strands of it being sufficient to hang a man.

"Referring to the Kew Museum of Economic Botany, I was informed by Mr. Hillier that in the Cuban catalogue of textile materials in the Paris Exhibition of 1900, there is the following brief allusion to what is no doubt *S. grandis*, 'Il y a d'autres plantes textiles, comme la Lengua de Vaca, *Sansevieria* sp.' The term cow's tongue appears to be appropriate to the form of the leaf of this species.

"Regarding the value of the fibre, a specimen of rope made from it, given me by Dr. Heath, was submitted by the Director of the Royal Gardens, Kew, to Messrs. Ide & Christie, fibre brokers, of 72, Mark Lane, E.C., who report that 'it is a good class fibre, much liked; its value to-day (September, 1902) is £35 per ton; but that it is not a regular article of commerce, only odd sample bales having been received in this country. The plant thrives in Cuba, but money is wanted to develop the industry.'

"It remains to add that its native country, though unknown, may be presumed to be tropical Africa, whence ten species have been described, of which six, including the present, have been figured in this magazine.

"*Sansevieria grandis* forms a strong tuft in a bed in the Temperate House, where it flowered for the first time in July, 1901."

This plant has since been propagated and distributed to various botanical centres in the Colonies.—J.H.H., *Kew Bulletin*, 1908, No. 1, page 371.

No. 5.—POTATO SCAB.

(*Oospora scabies*, Thaxter.)

[*Plate* 77.]

By I. B. Pole Evans, B.A., B.Sc., F.L.S., Plant Pathologist.

Potato scab is one of the commonest and most widely distributed fungous pests against which the potato grower in South Africa has to contend. The disease is readily recognised by the dark brown scaly patches present on the surface of the tubers. In some cases the scaly patches are distributed sparsely over the tuber, while in others the whole tuber is covered with a scaly or scabby surface. These rough patches are produced by the action of a parasitic fungus which attacks the tubers while they are buried in the soil, and it is through the importation of these affected tubers that the disease has been introduced into this country and then distributed from place to place.

The potato scab fungus flourishes best in sandy or gravelly soils, and the addition of lime or wood ashes to such soils greatly increases the danger from scab.

Recent experiments carried out at the Leeds University show that the use of sawdust, at the rate of 5,000 lbs. per acre, applied over the sets at planting time greatly diminishes scab on land very subject to it. The generally received explanation of this is that the sawdust increases the water-retaining power of the soil, but the experiments alluded to hardly countenance this view, but rather suggest that the beneficial effect may be due to the avoidance of abrasions to the skin of the potato during its growth. Such abrasions are much more likely to occur in a gravelly soil, or in a soil containing ashes.

Potato scab can easily be prevented if the proper precautions are taken. Scab may be introduced into a crop in two ways, either by means of contaminated tubers for seed purposes or by the use of farmyard manure which contains the germs of the disease from potato peelings, etc. It is against these two possible sources of infection that the farmer must be on his guard.

* * * *

Diseased tubers can be completely sterilized by immersing them for two hours in a solution containing one pint of formalin to thirty gallons of water. Formalin is a clear volatile liquid with an irritating odour. It does not possess any violent poisonous properties which are harmful to those handling it, beyond the fact that the fumes given off have a particularly irritating effect on the eyes and nose. In concentrated form it must, therefore, be handled with caution. It is very poisonous to plant life, and on this account is made great use of as a fungicide. It is sold by all chemists at about 3s. a pint.

If a large consignment of potatoes is being dealt with, it is best to immerse the potatoes as they are, together with their sacks or cases, in a large tank containing the liquid. They can then be taken out, and after being stacked up to drain, are ready for planting out immediately. Land which has once produced a scabby crop will retain the germs of the disease for several years, and consequently should not be planted with potatoes or any other root crop, such as beet, turnips or carrots, for some time.

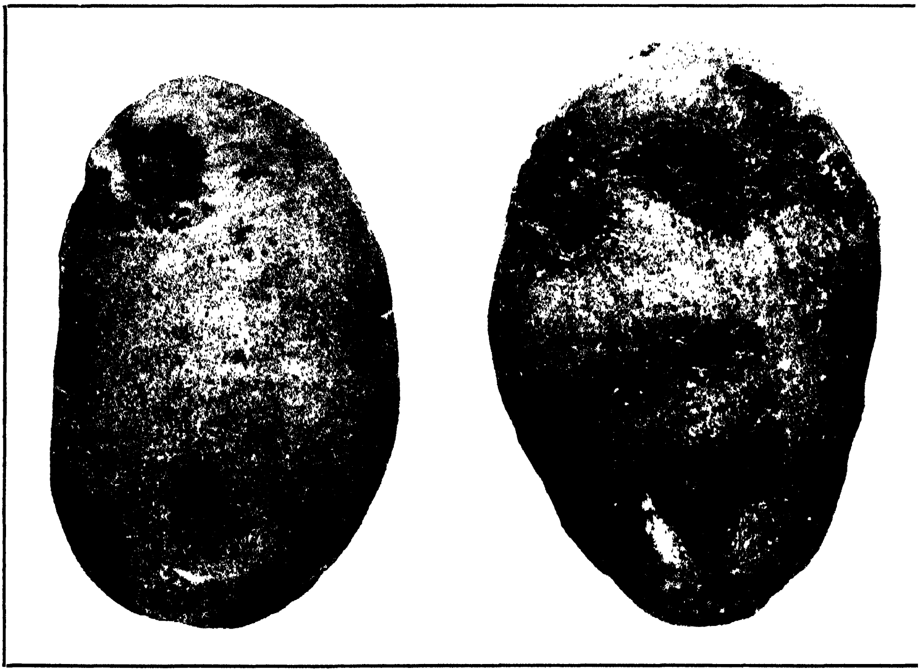


Plate 77. **Scab on Potatoes.**

(*Oospora Scabies*, Thaxter.)

Plate 78. **Anthracnose or Zwart Roest on the Vine Leaf.**

Plate 79.
Anthracnose or Zwart Roest attacking Grapes and Vine Shoots.

Plate 80. **Anthracnose or Zwart Roest on the Grape.**

No. 6.—ANTHRACNOSE OR ZWART ROEST OF THE GRAPE.

(*Gloeosporium ampelophagum*, Sacc.)

[*Plates 78, 79, 80.*]

By I. B. Pole Evans, B.A., B.Sc., F.L.S., Plant Pathologist.

One of the commonest and most familiar diseases of the grape in this country is that known as "Anthracnose" or "Zwart Roest," which is often said to be the cause of the entire loss of what promised to be a heavy crop. The bunches, instead of ripening, just dry and wither up. The cause of all this is a minute parasitic fungus known botanically as *Gloeosporium ampelophagum*, Sacc. This fungus is now found all the world over wherever the grape is cultivated, although its original home was probably in Europe, where it has been known for years under such names as "Schwarze Brenner," "Pech," "Charbon," etc.

In America the disease is commonly known as "Bird's Eye Rot," from the characteristic blotches which are formed on the fruit. All green parts of the vine may be attacked. The leaves when first affected exhibit yellowish spots, surrounded by a dark coloured margin The tissue enclosed within these spots frequently falls out, leaving the leaf riddled with holes which have a frilled or very irregular margin. (See Plate 78.)

On the shoots (Plate 79) the spots are of a dark brown colour, with a lighter reddish brown margin. They are somewhat lenticular in shape, and conspicuously depressed in the centre As the spots enlarge, they run one into another, forming a deep-seated scar which elongates in the direction of the axis of the shoot.

On the berries (Plate 80) the fungus forms brown circular spots, with a bright red inner margin. A berry thus attacked is soon checked in growth. It at once begins to wither and dry up, and remains attached to the bunch, from whence it infects its neighbours, with the result that the whole becomes diseased.

* * * *

In dealing with this pest, it is most important to cut out, remove and burn diseased material as soon as possible. Anthracnose is best combated by treating the vines in winter, when they are in a dormant condition They should then be thoroughly drenched with a solution of iron sulphate As this solution is of a corrosive nature, it should only be placed in wooden or earthenware vessels, and should not be applied by means of the ordinary spray pumps, but should be put on by means of a mop or swab made of rags attached to the end of a broom handle. This solution has the advantage of turning the branches black, which serves as an index as to the thoroughness of treatment.

The solution is made up as follows:—

Iron sulphate	25 lbs.
Water	50 gallons
Sulphuric acid	1 pint.

Place the water in an earthenware or wooden vessel, and then, after enclosing the iron sulphate crystals in a coarse sack or bag, suspend them in the water. Add the sulphuric acid gently by degrees, and the solution is ready for use as soon as the iron sulphate crystals have dissolved.

If the disease has been particularly troublesome, it is well to drench the trees a second time after an interval of fifteen days. Should any signs of the disease be noted after this treatment, when the new growth appears, a good dusting of flowers of sulphur with one-third its quantity of powdered quicklime should be applied. These applications should then be continued at intervals of ten days until the disease is completely checked. Iron sulphate can be obtained at about 10s. per 100 lbs., and sulphuric acid at about 9d. per lb.

No. 7.—NOTES ON RUST-RESISTING WHEATS.

By H. Godfrey Mundy, P.A.S.I., Assistant for Seed and Plant Experiments.

Public attention has been widely aroused by the various reports lately circulated regarding the discovery of a "*Rust Proof*" wheat in the Bethal District of this Colony. Some of these reports have been exaggerted, and are more or less misleading, but a few notes on the subject may, therefore, be acceptable.

The origin and name of this wheat is at present uncertain, but it is generally believed to be one of the "Spring" wheats of the Cape Colony. Dr. Nobbs, late of the Cape Department of Agriculture, finds that it closely resembles a local variety known as "Du Plessis" corn, and it is not unlikely that this is the correct name. However that may be, we know that it was introduced into the Bethal District in the spring of 1906, and was then sown experimentally on a small scale. The trial met with success, and in the spring of 1907 a larger area was sown down; in spite of the extremely heavy rainfall of that year this wheat still continued to yield satisfactory crops.

By this time its good repute had spread through the district, and seed of it had come into the hands of several of the more progressive farmers, with the result that in the summer of 1908 a considerable amount was sown. It is difficult to ascertain the exact area, as it is likely that many farmers who were still doubtful planted only on a small scale, but 200 to 300 acres have been estimated as the probable extent. One or two other sorts have also been grown as spring wheats in different districts, and these also have in some cases proved more or less rust-resisting.

Last summer, as is too well known, was extremely droughty, and the greater part of the rainfall occurred during the earlier months from September to December. The following table, showing the rainfall from September, 1907, to February, 1908, kindly furnished by the Meteorological Department, demonstrates this point:—

	Bethal.	On days.	Trichardsfontein.	On days.	Balfour.	On days.
September ..	0.74	3	0.78	4	3.03	5
October ..	5.56	13	2.73	8	3.54	10
November ..	4.67	15	6.49	12	8.28	11
December ..	4.29	14	Incomplete 2.84 average*		2.56	5
January ..	4.63	15	2.50	12	1.32	4
February ..	3.21	9	1.69	9	2.67	4
Total ..	23.10		17.03		21.40	

* Added by author.

It will be seen that on the average more than two-thirds of the total rainfall for the six months fell between September and December. Owing to this the crops came away well, and rapid growth was made; while drier weather conditions prevailed when the crops were ripening off, and what rain did fall was usually distributed over a considerable number of days.

I personally visited one farmer growing this wheat, and found excellent crops standing early in March and just ready for cutting. The plants were not entirely free from rust, but the attack was so slight that no injury appeared to be done. Another crop grown near Heidelberg was inspected by the Plant Pathologist, and though at the time of his visit the crop was already harvested, traces of rust were to be found. In one instance the leaves had been badly injured, but the straw and ear appeared quite unharmed.

In appearance this wheat somewhat closely resembles Rietti. The ears are from 2½ to 3 inches long, rather light, and sparsely bearded, spikelets very lax and usually containing 2 grains; the glumes are smooth, shiny and whitish, but the colour varies somewhat, as in some cases ears appear almost as dark as those of Rooi Klein koren. The straw is strong, medium fine and hollow. On rich, moist land it grows rather too strongly, and develops straw at the expense of the ear. The grain is darkish-brown in colour, long and tapering in shape and rather floury (soft).

Looked at from a general point of view, its chief fault lies in the laxness of the ear, as this indicates that when ripe the grain may shed readily. It will probably be found advisable to harvest the crop slightly before it is quite ripe, otherwise considerable loss may be experienced in cutting and carrying.

For successful results it is important that sowing should be commenced as early as possible in spring with the first rains, and where practicable September sowings are to be recommended. Seeding should not be too heavy, from 80 to 100 lbs. per acre (about half a morgen) will usually be sufficient.

It is probable that this wheat will do best on medium, fertile loams; rich and damp vlei soils are rather to be avoided, as also is raw newly broken land. For the next year or so, until its rust-resisting qualities have been more thoroughly tested, growers will be well advised to sow on land which has carried crops other than wheat or oats the previous year.

In spite of the tendency to shed and general lightness of ear this variety appears a fair yielder, in one instance a return of about 22 bushels per acre being recorded.

In conclusion, it may be well to sound a note of warning; because this wheat has so far proved somewhat rust-resisting is no certain argument that it will continue to be so illimitably. It is no unknown thing for a wheat to be partially immune when first introduced, and for this immunity to break down during the second and third year of cultivation. It is true that the Bethal wheat has now survived three seasons, but it should be remembered the last one was extremely favourable for summer-sown wheats, and although it is certainly worth further extended trial, yet intending growers would be well advised in sowing to a more or less moderate extent until these points have been more clearly demonstrated.

It is also possible that seed directly imported from the Cape Colony will give better results and prove more immune than seed already grown for a year or more in the Transvaal. This point is receiving our attention and will be tested next season.

The following gentlemen are known to the Department as having grown successful crops of rust-resisting wheats and will probably be able to supply seed on application, if their stocks are not already disposed of :—

J. Fourie, Esq., Zandfontein, P.O. Bethal.
O. J. Griffin, Esq., P.O. Trichardts, Bethal.
A. W. Usher, Esq., P.O. Balfour, Heidelberg.
J. Cornelissen, Esq., Rietspruit, P.O. Holmdene.

No. 8.—EXPERIMENTS WITH WINTER GRASSES AND OTHER PASTURE PLANTS.

By H. Godfrey Mundy, P.A.S.I., Assistant for Co-operative Experiments.

I had the pleasure of making a short trip through the Lake Chrissie district about the middle of last February, and Caledonia, belonging to Mr. J. Dundas Hamilton, was one of the several farms which I visited.

Mr. Hamilton has been experimenting for four years with winter pasture plants, and I was greatly impressed with the results he has obtained. His grass paddocks are a most agreeable sight, and if, in spite of the very dry summer we have just experienced, they still hold their own against weeds and the natural veld grasses and continue to afford good winter grazing, I think that in this district at any rate payable winter pastures can be established. It must be pointed out, however, that west of Carolina, where the climate is less moist, the grasses used by Mr. Hamilton, viz., cocksfoot, Chewing's fescue, Timothy, and rye grass have, as a rule, given negative results.

The soil of this locality, though as a rule poor, is eminently suited to conserving moisture during the dry winter months. In many parts it consists of a medium stiff, blackish, sandy loam which, owing to the presence of the sand, is not badly subject to packing and cracking during dry weather. On the contrary, the sand appears to work to the surface and there form a mulch of loose soil admirably fitted to check evaporation.

Naturally there is considerable variation from this class of land, but where it does occur it should be particularly suitable for the laying down of winter pastures. It would appear also that profitable crops of dry-land winter wheat could be raised on the same class of soil, provided it overlays a partially impermeable sub-soil and proper cultivation is bestowed upon it during the summer months.

Small dressings of manure would probably be necessary, but further experiments along these lines are needed and are certainly worth the attention of the farmers of this district.

Mr. Hamilton has kindly furnished the following particulars of his trials and results :—

"Among the obvious advantages of grass sowing in those places where it is possible are : (1) The security from poison in the herbage at all times of the year ; (2) the ending of the necessity for winter trek ; (3) the increased carrying capacity of the farms—there are many places where the land is good but where the farmers are afraid to keep sheep owing to its bad reputation, sheep having died there at some time ; (4) the abolition of burning for feed, a practice which is most detrimental to the land, but which under the present circumstances appears inevitable, as in the coarse and sour veld about here it is only the very young growth of grass after burning that has any fattening capacity ; when over four inches high the sheep do not like it and do not thrive on it.

"My chief success has been with cocksfoot, which I find stands admirably, and of which I have an acre now three years old ; it is very good, and is an illustration of what can be done with this grass. In different situations and under different conditions it has fared differently, but in no case has it been winter killed nor has it died out.

"In all I have about 50 acres of sown grasses. In some places I sowed mixtures, cocksfoot, rye grass, red and white clovers, cow grass, alsike and Chewing's fescue. The rye grass soon disappeared, and the sward is poor in consequence, but the paddock is still very useful with the cocksfoot, fescue, and some of the clovers.

"My first sowings were on new land, broken up and sown the same autumn, and these were not a success, though they looked promising the first season ; the weeds were too strong for them and crowded them out. To be successful, the land must be carefully chosen and well worked. Cocksfoot grows well on any low-lying well-drained land—better, of course, if it gets some seepage from springs above, but this is not necessary. Where it grows well, I have found both cow grass and Timothy do well. Last year I made 15 tons of English grass hay, of which a portion was Timothy 4 feet high. This grass, however, does better with more moisture than cocksfoot, and it is not easy to find much land where it can be grown at its best. Cocksfoot grows fairly well for a certain distance up the ridges, but at a marked limit it becomes poor and weak and will probably die out.

"Where cocksfoot finds the land too poor and dry, Chewing's fescue succeeds and makes a very good sward on poor ground. This grass, I believe, will be of great benefit to sheep growers, though too short for a cattle grass, except on rich lands which will grow better grasses. It kept green with me all last winter, and on the 50 acres of sown grasses, comprising some which, as I have said, were not successful, and a few turnips, I kept 250 sheep in very good condition. The tips of the cocksfoot turned brown late in the winter, but a green bite could always be had under the brown right up to the rainfall.

"Chewing's fescue is a grass that will last indefinitely, I think, but of course it has not the feeding value of cocksfoot, rye grass, clovers, etc., and for this reason it is not sown in New Zealand, where the better grasses thrive. In good lands there it becomes such a mat that it is often difficult to break up with the plough, and is then considered a nuisance, but in the pumice districts of the North Island and on other poor lands it is sown with excellent results—on such soils it forms a short but excellent sheep

feed. As it has kept green with me here all last winter I think it promises well for this district.

"White clover does very well on the low-lying land, and I have found both it and cocksfoot growing on the veld below the grass lands, where the rain has washed the seeds.

"In order to obtain a good and clean sward of grass I recommend the seed to be sown on the third ploughing after a crop of winter oats, harvested early. Seed to be got in by the end of February. A good sowing for this district is 30 lbs. cocksfoot, 2 lbs. white clover, and 3 lbs. cow-grass, and in the wetter parts 3 lbs. Timothy may be added.

"There are some kinds of land where no results can be expected, and chief among these is land which has the coarse, creeping water grass, unfortunately so often found here on some of the best damp lands.

"I tried paspalum for the first time last year. It came up very well and looked promising, but turned quite brown and dead in winter; in spring it came up again strongly. My patch is too small to draw any certain conclusion from, and it should be tried in a variety of places before we can be sure of its value.

"Burnet has done well and kept green late into the winter, ribgrass likewise, and I believe these may be made considerable use of on poorish land; the seed is cheap and anything is better than to let the mealie lands that are finished with go back to nothing but weed. I would suggest using ribgrass and Burnet for such land if it is not suitable for the better grasses."

No. 9.—BOTANICAL NOTES.

1.—Angola Grass or "African Wonder" Grass

(*Panicum spectabile*, Nees).

A correspondent of one of the daily papers has recently quoted a glowing account of this grass from the pages of the Queensland *Agricultural Journal* of February last, which has resulted in our receiving numerous enquiries for seed.

This grass is a native of Angola, and is, therefore, a strictly tropical species. It withstands a certain amount of drought, but not frost, and is therefore unsuited to prevailing conditions in the Transvaal high and middle veld. We have grown it at the Botanical Experiment Station, Skinner's Court, and at the Experiment Farm, Potchefstroom, but the results have not been satisfactory owing to our low winter temperature.

The only parts of the Transvaal where it is likely to succeed are in the bushveld at, and below, 2,700 feet altitude. There we already have our famous Buffel grass (*Panicum hirsutissimum*), which is a much better grass than the Angola grass is ever likely to be with us. I would advise farmers in that part of the country to collect and sow down paddocks of Buffel grass before attempting Angola grass, which at best is a rank-growing species, too coarse for hay.

Seed of Angola grass is offered by certain European firms at 1s. 6d. per oz., wholesale.—J. Burtt-Davy, Government Agrostologist and Botanist.

2.—Storage of Baled Lucerne Hay.

The following statement by Professor A. M. Ten Eyck, of the Kansas Agricultural Experiment Station, is published in the *Kansas Farmer*, and may be of interest to Transvaal growers :—

An average bale of lucerne hay, sold on the market at Manhattan, Kansas, weighs about 85 lbs., the average length of the bale is about 40 in., making a total volume of a bale about 7 cubic feet. Twenty-three and one-half bales will make a ton, figuring 85 lbs. per bale, and 164·5 cubic feet of space will be required to store these 23½ bales, that is figuring actual volume; doubtless we should add 10 per cent. more space for room lost between bales in storing, making about 180 cubic feet of space required for storing a ton of baled lucerne hay. Ordinarily, 512 cubic feet is figured as the volume of a ton of hay in the mow or stack soon after stacking, or about the time hay is well settled. The volume of a ton of baled hay is, therefore, equal to about one-third the volume of a ton of loose hay in the stack or mow. If the total space in the barn holding 25 tons of loose hay could be used for storing the baled hay, the barn would hold in the neighbourhood of 75 tons of baled hay.

3.—Possibility of Doubling the Present Yield of Maize.

It is possible within a few years to double the average production of maize per acre in the United States, and to accomplish it without any increase in work or expense. It is not to be understood from this statement that it is desirable to double the present maize crop, but that it is desirable to produce the same yield on a smaller number of acres, and with less labour. If 60 bushels (a bushel of maize on the ear is calculated at 70 lbs. weight) are raised on one acre instead of on two acres, the labour of ploughing, harrowing, planting, cultivating and harvesting is greatly reduced. The demand controls the quantity that should be grown. To meet demands the producers of the United States have, during the ten years previous to 1904, averaged in round numbers 2,000,000,000 bushels of maize yearly. In producing this amount a little more than 82,000,000 acres have yearly been devoted to maize growing. The average production per acre has been 24.2 bushels. Very few farmers would like to acknowledge that their average production for the past ten years has been less than 25 bushels per acre, but from the best estimates that have been made the conclusion is unavoidable that half of those who grow maize harvest less than 25 bushels per acre. Twice this quantity is a fair crop, three times 25 bushels is a good crop, and four times 25 bushels per acre are frequently produced.

The lines of improvement that will most easily and quickly double the present production per acre are as follows :—(1) Improvement in the quality of seed planted, (2) improvement in the condition of the soil, (3) improvement in methods of cultivation.—C. P. Hartley, in U.S. Department of Agriculture, *Farmers' Bulletin*, 199.

* * * *

4.—Notes on Co-operative Experiments.

Teff Grass (*Eragrostis abyssinica*).

Middelburg District.—Splendid results, cattle and horses do particularly well when grazed on this grass. Seed from the Department of Agriculture, sown on old lands after three crops of maize, soil red and

sandy, very poor. Plate 72, from a photo taken 15th February, 1908, shows the dairy cattle feeding in a teff grass paddock.—L. KNAPMAN, Manager, Witbank Colliery Farm.

VELVET BEAN (*Mucuna utilis*).

Middelburg District.—Grown by L. Knapman, Esq., Manager, Witbank Colliery Farm. Sown November, 1907, photo taken 15th February, 1908 (Plate 71). Very poor, red sandy soil. In spite of almost unprecedented summer drought and a very poor soil, a good crop of beans will be harvested. Mr. Knapman proposes to use the beans for winter feed for dairy cows. For feeding purposes it is recommended to grind up pods and beans together, thus saving the expense of thrashing. The meal so obtained may then be used as a concentrated feeding stuff in the same manner as cotton-seed meal. It is said that cattle, sheep, pigs and poultry are all very fond of velvet-bean meal, but that horses apparently do not relish it.

5.—EXPERIMENTS ON THE SPRINGBOK FLATS.

The distribution of the rainfall during the past season was particularly erratic on the Springbok Flats. In spite of the drought, however, the experimental plots have given some useful data which will be of value to the farmers of the district. They have demonstrated that in velvet beans, pea-nuts, African red-top and teosinte we have four good drought-resisting crops suited to that part of the country. Major Doyle, D.S.O., reports as follows, under date of 28th April:—

African Red-top.

Sown 28th January, 1908, produced a fair stand.

Teosinte.

Sown 14th December, 1907, germinated well. The stools are excellent, and there has been no loss in plants, but the height is not more than 3 to 4 feet, owing to the set-back by drought and being on new ground.

Velvet Beans.

Sown 18th December, 1907. The germination was good, and, in spite of the fact that no rain fell for nearly five weeks after, I do not think a plant was lost. The crop is now looking well, though with less than 6 inches of rain.

Pea-nuts.

Two varieties, the Mammoth Virginian and the Mauritius, were sown 14th December, 1907. Germination was excellent, and a good growth was maintained during the long spell of dry weather. Their drought-resisting property was much commented on by all who visited the plots. It is only to be expected that the yield will be light, owing to the awful drought and the fact that they were grown on new land, which, in spite of constant cultivation, packed very hard.

THE ENTOMOLOGICAL SECTION.

AN ARMY WORM IN THE TRANSVAAL.

By F. THOMSEN.

Towards the end of January, 1908, a message was received at this office that the Townlands of Krugersdorp were over-run by huge numbers of caterpillars. By request I proceeded there at once, and found the northern part of the town swarming with a dark green, nearly black caterpillar. The streets, gardens, even the houses were covered with crawling insects, some crops had been eaten and others were threatened. The Municipality was advised as to the steps to be taken, and the destruction work was commenced.

By about the 12th of February the caterpillars disappeared; they had pupated underground. Nobody knew where the caterpillars came from, and various explanations were formed. To show how absurd some of these explanations were I will quote from an article printed in a daily paper of the 4th February, 1908.

"CATERPILLAR SCOURGE.

"WHAT THE HAIL BROUGHT FORTH.

"NEW TRANSVAAL PEST.

"Krugersdorp, Tuesday (Special).—From Paardekraal Monument to the old military camp, and along the residential ridge known as the district township, it is computed that two hundred million caterpillars have settled down to play havoc with all the sweet grass in the neighbourhood. The pests are black and furry, and about an inch long, and it is a remarkable fact that their happy hunting ground is entirely confined to the narrow area devastated by the terrific hailstorm of last month. Old colonists connect the visitation with the recent fall of hail, and they recall instances where plagues of insects have invariably followed a phenomenal storm. It is suggested that the stones carry some germ, which is launched into life when the melting process begins, and the farmers who penetrate deeply into the mysteries of the veld trace the periodical visitations of huge swarms of butterflies and moths, and even the dreaded tick, to the evolution of the germ in the hailstorm and deposited on the ground. Venerable Free Staters now resident in the district have vivid memories of the frightful storms in the late sixties and early seventies when similar caterpillar plagues devastated the crops in the conquered territory, and they also recall the interesting fact that when the black insects arrived the locusts disappeared. History is apparently repeating itself this season, for up to the present not a single locust has winged its frenzied flight in a district which was swept clean by the voracious little pest last season. Nature abhors a vacuum, and the void created by the absence of the locust is being filled by the comparatively innocuous caterpillar."

I do not believe that anybody would take this explanation seriously, as hail bringing down "germs" which develop into caterpillars or even ticks is both absurd and impossible. Animal life can only be brought into existence by pre-existing life. Larvae of insects have been known to be able to stand freezing in the water they live in, such as some of the northern mosquito larvae for instance, and remain dormant during the winter months in the ice, but as soon as this melts they revive and develop in the natural way. In this case, however, they were present as larvae, and did not develop from what the writer of above article calls "germs." I may also state here that the same caterpillar appeared this season, and also in the summers of 1907 and 1906 in various other parts of the Transvaal where no hail had fallen ; that they just apeared in Krugersdorp on or near the place the hailstorm had passed over is just a coincidence. If further proof is necessary it only remains for me to say that Mr. C. W. Howard, the Government Entomologist, wrote an article in the *Agricultural Journal* of October, 1906, dealing with the same caterpillar, to which he gave the name of "Pigweed Caterpillar" (*Caradrina exigua*), it being very abundant then about Pretoria, especially on the pigweed or mistbrede (*Amaranthus paniculatus*).

Life-History.

In spring, after the first rains, a pale brown moth, belonging to the family Noctuidae, or Owlet moths, may be seen flying about the veld. These moths are called "Owlet moths" because they fly at night, and because their rather large eyes glow with a deep phosphorescence as if internally on fire. They are easily attracted to the light. The minute white eggs are laid in strings as a rule in the leaf sheath of various grasses, the thickest tufts being selected. The eggs hatch out in about ten days, and the young larvae or caterpillars feed at first in the fold of the leaf, growing rapidly, and finally eat the whole leaf. Under ordinary circumstances, and if not present in large numbers, the caterpillars feed only at night or in damp cloudy weather, remaining hidden during sunshiny days. In this respect they resemble in habit the closely allied cut-worms. They reach full growth in about four weeks, and then proceed into the soil to transform into brown shiny pupae. In this condition they remain, during summer, for about a month, when the moth appears again.

The number of generations in South Africa is not yet known, but in all probability there are three.

In ordinary years these caterpillars appear in such small numbers that their presence is hardly noticed, but sometimes if the conditions are favourable, that is to say, if the grass is not burned and the eggs are not destroyed, or if we have late rains followed by a mild winter, so that the caterpillars can find some green food to carry them through the winter in large numbers, allowing them to pupate in the early spring, we find that large numbers of these moths make their appearance, and the result is that many eggs are laid and huge swarms of caterpillars hatch out.

When this condition is reached the food will soon be eaten up and the caterpillars have to move on to find fresh food plants. They travel in regular armies, hence the name "Army Worm" ; they cross roads, fences, and even small pools of water like voetgangers. As a rule only the sweet grasses are eaten, but when these are devoured other cereals, such as maize, wheat, oats, etc., are attacked. This caterpillar very seldom feeds on clover or lucerne.

I have recently seen these caterpillars clearing the grasses in a mealie field, but not touching the maize, and I have also noticed a large number feeding on the grasses round a Kaffir corn field without attempting to touch the Kaffir corn. They seem to prefer the grass, and their number was not large enough to enable them to eat up all the grass and thus force them to attack the mealies and Kaffir corn.

In Krugersdorp it happened as stated above. A large number of pupae hibernated under favourable conditions near the town, and just after the hailstorm the resulting caterpillars made their appearance, and finding the young grass—which was springing up after the old plants were knocked about by the hail—to their taste, they all moved in that direction, congregating in huge masses, so that they had to look for fresh pastures after the young grass was cleared.

In March I saw the same caterpillar on the road north of Pretoria in large numbers, and the area infested reached from Leeuwkraal right down to the Pienaars River. I also had reports from various farms in the Springbok Flats that the caterpillar was there in large numbers, and there was no hail in most of these places.

* * * *

Description.—The full-grown caterpillar is 1½ to 1¾ inches long, of a dark green, nearly black, colour. Head nearly black, with a V shaped mark in front. The first segment of the thorax has three whitish stripes on the back, the middle one is very faint, each of these stripes fork out in two just before the second segment is reached, these run close together right back to the last segment, the first segment is much darker in colour than the others. On each side runs a black velvety stripe, bordered by yellow, the spiracles are marked by white spots. Towards the under side, which is of a fleshy colour, two lighter stripes, which also begin as one stripe on the first segment, border the black middle stripe, thus bringing it out more prominently. The caterpillars drop off the food plant when disturbed, and remain rolled up for some time. They enter the ground to pupate. (Plate 82.)

The pupa is of a shiny mahogany brown colour, and is from 6-10ths to 7-10ths of an inch long. Head and wings are of a lighter colour. Two spines are formed on the caudal extremity. The pupa rests in a case formed of the surrounding ground: after about 30 days the moth emerges. The pupae under observation were formed on the 5th of February and hatched out on the 20th of the same month. The moth flies at night, as mentioned above: the wings expand from 1 inch to 1 3-10ths of an inch; length of body is between 6-10ths to 7-10ths of an inch.

The general colour of the moth varies a good deal; dark grey, light grey, to even pale brown specimens can be found. On the front wing near the centre, and close to the front margin, a small round or oval pale ochreous spot can be found. Towards the outer margin is another larger, irregular shaped (reniform) black spot, bordered by a thin yellowish band in the lighter specimens; this spot often varies from black to light brown. Running along the outer margin are a series of dark spots forming a band. The hind wings are semi-hyaline and of an opalescent white colour, veins tinged with brown; parallel to the outer margin runs a narrow brown band, hind margin bordered with soft, white hairs. The thorax is from dark to light brown in the various specimens. Abdomen dark to light grey, with a darker spot on the tip, ending in a tuft of brownish hairs.

These moths were identified as *Caradrina exigua* and some as *Caradrina orbicularis*. There is apparently some confusion between these species, as both adult forms seem to come from similar larvae. Both were reared from the Krugersdorp caterpillars.

Food Plants.—The principal food plants for this army worm are the sweet grasses. If these caterpillars appear in moderate numbers, and if the sweet grasses are plentiful, no other plants will be attacked. It has been noticed in a mealie field near the Springbok Flats that only the sweet grass had been attacked; other plants near by, such as pigweed, beans, or even the mealies itself remained untouched. Some farmers and also natives seemed rather glad of the presence of this caterpillar; they said that it saved them lots of labour by clearing the grasses growing between the mealies and Kaffir corn. When the sweet grasses, however, fail, the caterpillar will eat nearly everything. Lucerne and clover I found was not touched in the breeding cage for more than a day; the worms remained rolled up till some fresh grass was given them, when they started at once to engorge themselves.

Mr. Howard gives the following plants as food plants for this army worm in the Transvaal:—Pigweed (*Amaranthus paniculatus*), tobacco cotton, mealies, Oxigonum spec, Limeum viscosum, Cleome monophylla, var. cordata, eucalyptus, grape vine, beet, potato. I can add Kaffir corn, sorghum, wheat, oats, barley, manna, cabbages, quince, pears, apple, peach and other fruit trees, roses. I also noticed that some of the flowering shrubs and flowers were attacked in the gardens. From the United States of America, where this army worm is also a serious pest, it has been reported to feed on potatoes, pears, apples, beetroot, onions, maize, mallow (*Malva borealis*), lambs-quarters (*Chenopodium album*), pigweed (*Amaranthus retroflexus*), tobacco (*Nicotiana glauca*), saltbush (*Atriplex*), wild sunflower (*Cleome sp.*), plantain, all plants closely related to beets, and many wild weeds and grasses.

REMEDIES.

In his article on "The Pigweed Caterpillar," Mr. Howard wrote:—"Natural enemies seem to be very abundant; large numbers of Trachina flies were bred from the larvae, and a bacterial disease appeared about Pretoria, which carried off fully three-fourths of the larvae." This was in the season 1906-1907. This year, however, the summer being dry, no report of any bacterial disease was received. Most of the wild birds will eat them, and where fowls, ducks, geese, turkeys and guinea-fowls can wander about they will help a great deal to finish off the pest. A gentleman wrote to me on the 10th of February from Krugersdorp as follows:—"I find that fowls, ducks, turkeys, and wild birds eat them. As to animals and natives eating them I have no knowledge that they do." When the caterpillars appear in large armies and begin to wander about, gardens and fields can be protected either by digging trenches ahead of the approaching worms; the sides must be steep so that they cannot climb up again. The caterpillars can either be destroyed by covering them up or they can be collected, killed by heat and dried for fowl food, or if they have already entered the fields a rope should be pulled across the growing crops; this causes the caterpillars to drop off. They remain rolled up on the ground for some time. The irrigation furrow can then be opened up and the worms be drowned or be driven out by the water.

Arsenical sprays, as used against voetgangers, are also very effective. Where it does not matter whether the vegetation becomes scorched, a solution of 1 lb. arsenite of soda, 1 lb. brown sugar or treacle to about 16 gallons of water is the best to use. Spray this lightly over the grass in front of the approaching pest. In growing crops or on tender vegetation use 1 lb. arsenite of soda to 200 gallons water mixed with about 4 to 5 lbs. unslacked (stone) lime, or, if preferred, Paris green can also be used. Mix 1 lb. Paris green with 200 gallons water, add at least 2 lbs. of unslacked lime. Both these last-named sprays should be tested on a few plants, and if these are found to suffer, more lime must be added. Spray over the plants in a fine mist, and do not drench the vegetation.

This "pigweed caterpillar," or, as it can also be called, the "Transvaal army worm," has become a serious pest. In wet years bacterial diseases can decimate its numbers; various parasites, wild birds, etc., help also to keep the numbers of the individuals down. Should, however, these allies be missing, and the season be favourable, dry and warm, this army worm will appear in huge masses and do great damage.

I would ask all farmers and others interested in the welfare of this country to continuously fight this pest whenever it makes its appearance, may the numbers be ever so small. By keeping it in check in time serious damage might be prevented. This is not a pest, like the voetganger, which can be driven out of a field with considerable ease. If the army worms have entered a cultivated land of, let us say, mealies, where no irrigation is at hand, it would mean continuous labour to keep the worms off the plants. Deep cultivation and a careful watch should be kept of the grass plots near by.

Information of the presence of these army worms during the next season will be of great interest. All communications should be addressed to the Government Entomologist, Box 434, Pretoria.

THE DAIRY SECTION.

A SMALL CHEESE DAIRY.

By R. Pape, Superintendent of Dairying.

Since the cheese-making industry has been attracting some attention of late in the Transvaal some hints as to how to establish a small cheese dairy may be welcome. I purposely sketch a very small concern in order to meet the needs of the individual farmer who wants to start cheese-making on his own farm. The type of cheese selected is "sweet-milk." The process for making this cheese is simpler than that of the cheddar process, and therefore it will be easier for the novice to learn thoroughly.

Those who intend to go on to cheddar cheese-making in future should allow more space in their dairies than is sketched in this paper. For cheddar cheese-making more machinery is required. Then cheddar cheese takes two or three times as long to mature as the sweet-milk cheese—therefore the store-room for cheese should be two or three times as large. The inner measurements of the rooms are 16 feet x 16 feet, which is to be considered a *minimum*. A larger room will not harm the cheese, and will also leave the opportunity for the future extension of the business.

The walls of the cheese dairy should be in natural stone wherever obtainable, and as thick as they can be made conveniently. The sketch shows a thickness of 2 feet. (Plate 86, Fig. 1.)

In this country the main difficulty in cheese-making will be to keep the heat out of the building. Refrigeration machinery is too expensive for a small concern, hence we must keep our dairy cool by means of thick stone walls. The inside of the walls and the floor should be well cemented over so as to form a hard, smooth surface, easily cleansed, where no dirt can accumulate.

For a roof the cheapest non-conductor is chosen—a good roof can be made of thatch covered with corrugated iron. The material used for the roof will vary with the district, wherever thatch is obtainable it should be used. If no natural stone is to be had, the walls can be made of brick, with two air spaces in the walls, but stone will answer the purpose better.

The cheese-making room should have five double windows. One window opening to the outside, the other to the inside. Between the windows fine metal gauze is fitted to prevent insects and animals entering the dairy when the windows are open.

The cheese store-room has five windows on the south, to prevent the sun shining on the cheese. Therefore we leave the eastern and western walls of the store-room without windows at all.

The shelves are each about 10 feet 9 inches long and 1 foot wide, and 1 inch thick at least. Each set of tiers has three supports (see Plate 86, Fig. 2), one at each end and one in the centre. Between each two successive shelves is a space of 1 foot. Between the tiers a space of about 2 feet is left, being plenty for walking between.

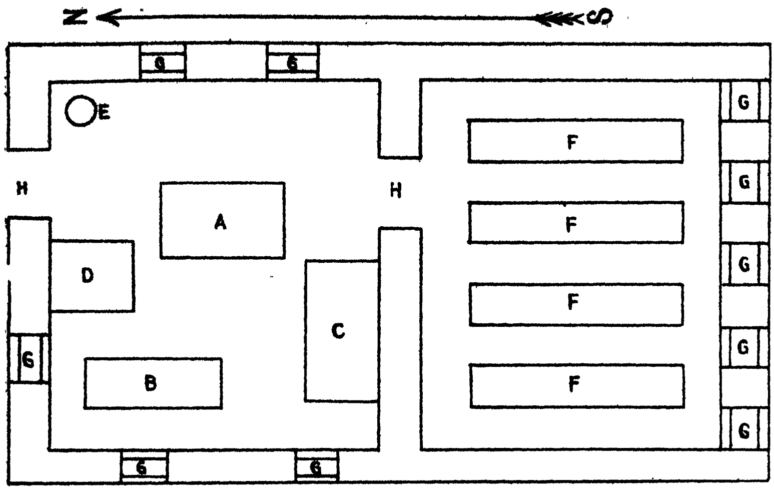


Fig. 1.

Plan of Dairy.

A—Cheese Tub. B—Cheese Press. C—Brine Tub. D—Working Table.
E—Boiler or Hot-water Kettle.
F—Tiers of Shelves. G—Double Windows. H—Doors.

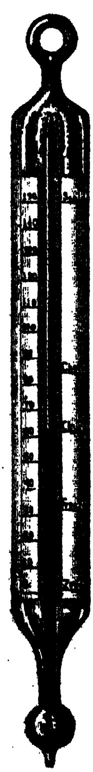


Fig. 6.
Dairy
Thermometer.

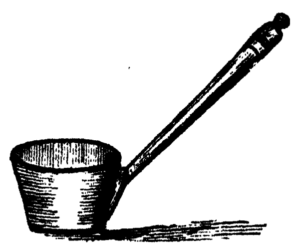


Fig. 3.
Rennet Mixer.

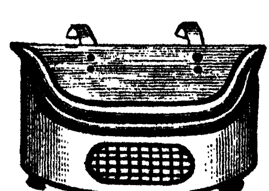


Fig. 4.
Milk Strainer.

Fig. 5.
Hair Sieve.

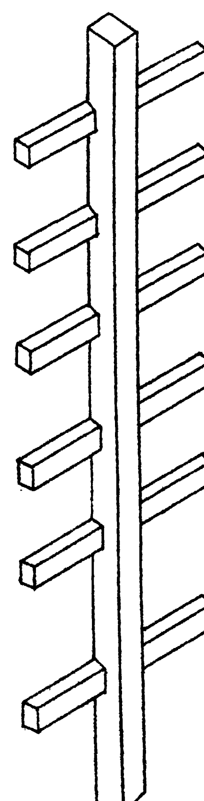


Fig. 2.
Support for Shelving.

Plate 80.

When light is not absolutely required the curing or maturing-room should be kept as dark as possible by means of blinds. The atmosphere is likely to be too dry for a proper curing of the cheese—more especially in winter. We may obviate this by nailing strips of cloth against the blind walls, and letting the end of the cloth hang in pails with water. This will keep the cloth damp and cause a steady evaporation of water, which will moisten the atmosphere. In some cases it may be necessary to keep water standing all over the floor of the curing-room.

The room will hold 480-520 cheeses, say 500 of the 12 lbs. type. This represents the approximate output of a dairy where 50 gallons of milk are worked twice daily (together 100 gallons) for two months. In this time the cheese is ready for sale, but it will improve by keeping longer. In a dairy where less than 100 gallons of milk is worked per diem—the curing-room will afford space for a proportionately longer period.

* * * *

The process is very simple, in fact it is based upon the Gouda process. The freshly drawn milk is poured through the strainer into the cheese vat. (Plate 86, Fig. 4.)

The quantity of milk is ascertained by means of the gauge and the quantity of rennet to be added calculated. This quantity depends on the strength of the rennet. A good rennet-maker will never send out bottles without putting a prescription for use on the label. So much rennet should be taken as to ensure proper curdling within 30 to 60 minutes.

Our next care is to take the temperature of the milk. Freshly drawn milk should not be very far from 86° Fahrenheit. If the milk is colder run hot water into the space between the inner and outer cheese vat till 86° is reached; then dilute the quantity of rennet with 10 to 20 times its volume (at least) of pure cold water, add it to the milk and mix well by means of the rennet mixer. (Plate 86, Fig. 3.)

Next we cover up the cheese vat. For this purpose use a framework covered by cloth, fitting the top of the cheese vat. This covering up is required for preventing loss of heat. Further, it will prevent dirt from sifting in during curdling.

Every little while the changes occurring in the milk are noted by inserting one finger to see whether the milk still runs from it in drops or already begins to thicken. By the time you think the milk should be "hard" enough, you lay your dry flat hand on the curd and withdraw it gently. No curd or milk should adhere to the hand.

A further test is to insert the hand vertically, close to the side of the vat and move it gently forward. Then the curd should loosen easily from the side of the vat, and no strip should adhere. Next move the hand gently upwards by wrist action, upon which the curd should split with a clean sharp edge. In the cleft some clear serum should show. In the beginning we used the curd knives (Plate 87, Fig. 2) very slowly and gently, cutting alternately lengthways and crossways. By this time the curd will have ceased to float on top of the whey as it did in the beginning. Little cubes of curd are formed now which should show sharp edges. During this part of the cutting you insert the knife, pull it slowly to the other end of the vat, take it out and reinsert it. After some time the curd is firm enough for

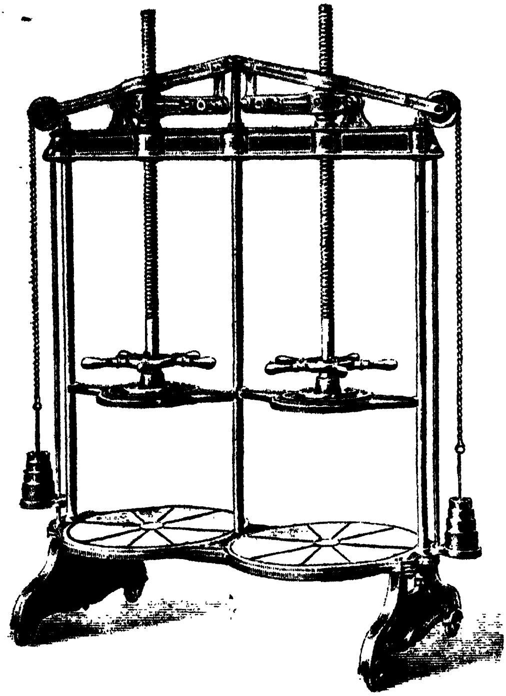


Fig. 1.
A Double Iron Cheese Press.

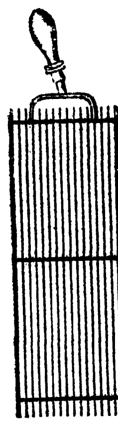


Fig. 2.
American
Curd Knife.

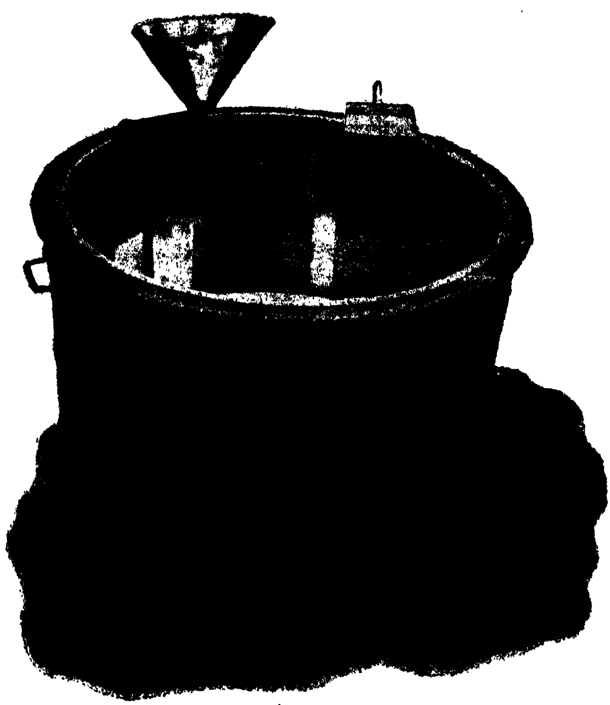


Plate 87.

Fig. 3.
A Cheese Vat of the smaller size (22 to 60 gallons).

severer cutting. Now do not take the knife out any longer, but push it forward and backward through the curd. This part of the process must be learned by experience—no description can adequately render it.

* * * *

At the end of the cutting the grain of the curd should be of small size; and feel somewhat heavy on the hand, but soft and silky. There should be a tinge of colour on the grain, higher than when we started cutting. The cutting process is longer or shorter according to degree of ripeness of the milk, quantity of rennet, and temperature used, but in general it should last from 15 to 30 minutes. Now the strainer is inserted and part of the whey drawn off. An exact quantity cannot be mentioned, but the practical custom is to let the whey run off till the top layer of curd is bare. A tablespoonful of salt (some makers prefer saltpetre) is dissolved in whey. This has a physical effect on the curds, and checks somewhat undesired fermentation.

The curd is carefully stirred with the hands till no clots or accumulations are left, after which the scalding is undertaken. Hot water is poured between inner and outer cheese vat whilst the curd is being continuously stirred. In scalding the temperature which has dropped somewhat, usually 1° to 2°, is brought up to 90° Fahrenheit. after which all the hot water is drained off. This scalding should take at least ten minutes, but a little longer time will not hurt the curds. Now follows the after-stirring, which is continued till the curd has reached the desired condition—it should be smooth, and silky, elastic, and fairly dry between the teeth. When balled together in the hands and slowly broken it must not split smoothly, but with a ragged edge, as if it were hanging together, unwilling to split. A small wooden board is taken fitting exactly the cheese vat —the board being about 6 inches high. By means of this board the curd is slowly pushed to the upper half of the cheese vat and when the board has compressed the curd in a space a little shorter than half the length of the cheese vat it is kept steady for a few moments to let the curd pack together well. Then the rest of the whey is drawn off. The cake of the curd should be "springy" to the touch, if compressed slowly but firmly by the hand, it should not break, but give, and after the withdrawal of the hand the compressed part should quickly rise to the surface again, leaving no indentures. The curd vats are filled, if possible, with one lump of curd, just big enough for one cheese. (Plate 88, Figs. 3 and 4.)

Later the vats are "turned," *e.g.*, the cheese tipped out of them and carefully replaced, upside down this time. Finally a cloth is put round the cheese. The cloth is stretched over the opening of the curd vat, which is subsequently tipped, the cheese being packed in the cloth, put back in the vat, the cloth carefully folded and the "follower" put on top.

* * * *

The cheese is left under the press (Plate 87, Fig. 1) for about an hour, and then "turned," *e.g.*, taken out of vat and cloth, turned upside down, reclothed and vatted and put back under the press. This turning should be repeated two or three times after an hour's interval. In the beginning the cheese is pressed with a light weight,

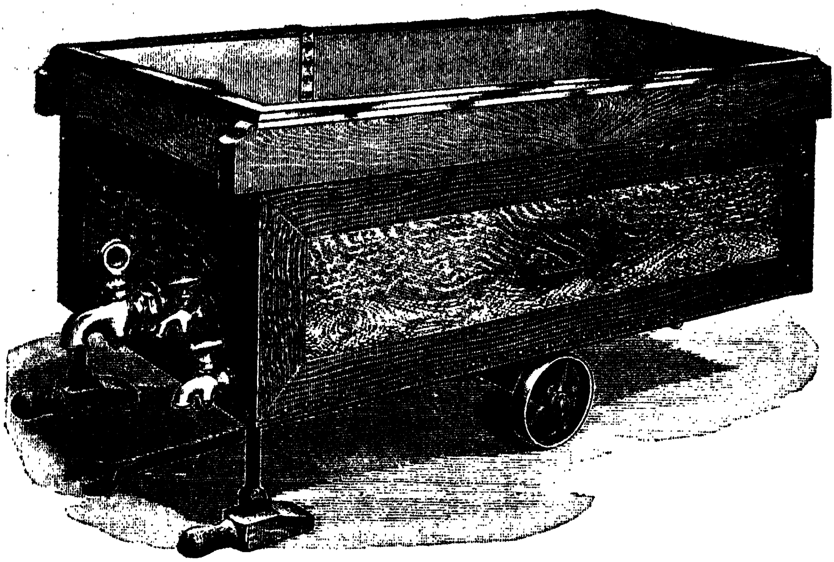


Fig. 1.

A Cheese Vat of the larger size (70 to 600 gallons).

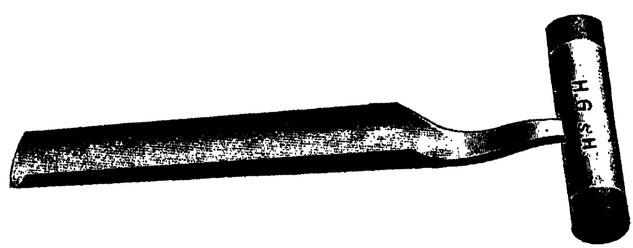


Fig. 2.

Cheese Tester.

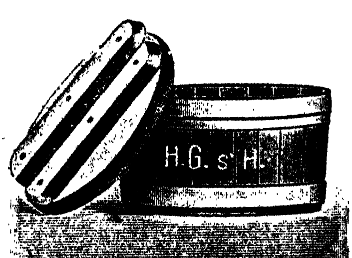


Plate 88.

Fig. 3.

Gouda Cheese Mould.

Fig. 4.

Edam Cheese Mould.

which is gradually increased as time goes on. Pressing lasts 24 hours. After this the cheese is carefully "unpacked," the cloth taken off, the "rim," if any, cut away and replaced in the vat upside down. The flat side of the cheese now comes in contact with the bottom of the mould, and as this bottom is rounded the flat surface will be gradually rounded. Usually this takes a couple of hours. No cheese should be taken from the vat definitely till it is perfect in shape. The following process is the brining:—

A strong salt solution which will float a potato is made, and the cheese floats in this for four to five days. Every day it is turned upside down and the side floating uppermost is strewn over with large grained cheese-salt. The brining tub should be covered with boards so as to exclude light and prevent the heating of the brine. After brining the cheese is placed in a dark place for a day or two to dry. (It will be best to devote a special corner of the curing-room to this purpose) and then placed on the shelves in the curing-room. (See Plan.) There it is "turned" daily and wiped with a damp cloth till it is ready for sale.

About the appliances shown in the illustrations I should like to make a few remarks.

As to the cheese vat, I think the round shape (Plate 87, Fig 3) is preferable for the smaller capacities, say 22-50 gallons, for the larger sizes, however, starting at 60 gallons the other shape (Plate 88, Fig. 1) is better. The very large cheese vats could not be heated by hot water—this would take too much time, and they are usually arranged for steam connection only. But the vats at 70 gallons can be had with steam connection, and where a boiler is available this method is to be preferred as it is much simpler and quicker to heat by steam.

The American curd knives generally err on the side of having the knives too close together. On a width of 7 inches twelve knives should be counted. As a rule fourteen to eighteen knives are found on 7 inches, and this is too close—the curd suffers too much in cutting.

The thermometers (see Plate 86, Fig. 6) are frequently incorrect, and a guarantee should be asked with each thermometer that it was correct within one degree.

The curd vats must be perfectly smooth and even on the inside. So much depends on the curd vat for the subsequent shape of the cheese that only vats from the very best makers should be used. The "cheesecloth" offered in this country is much too large in mesh —a fine meshed calico serves the purpose much better.

The important question of cost I have left until the last, and I regret that I cannot mention a definite figure for the cost of the building, as this varies so much according to local conditions. I have heard estimates varying from £50 to £100. The plant used in the cheese-making-room could be purchased for £40 to £50, so that a rough estimate would tot up £100 or £150. This of course is a minimum, and a modern up-to-date cheese dairy with all the latest improvements would cost a good bit more. But I have tried to show here that even with a small quantity of milk it would pay to erect a cheese dairy. Good drainage is of course indispensable (building on a slope). The whey tank should be at some distance outside the dairy, and the fresher the whey is fed to the pigs the better.

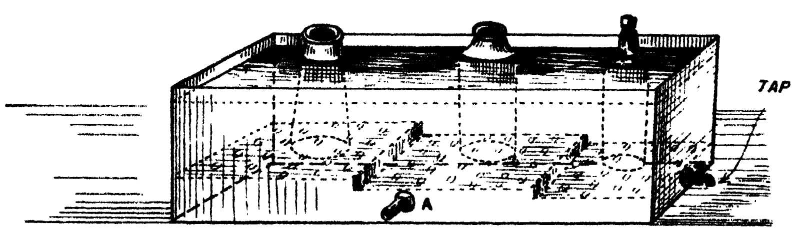
I shall be pleased to furnish further information to any farmer who is interested in this subject and desires to erect a small cheese dairy.

THE PASTEURISATION OF SMALL QUANTITIES OF MILK AND CREAM IN BOTTLES.

By Robert Pape, Superintendent of Dairying.

I have frequently been asked for an apparatus to pasteurise *small* quantities of cream and milk.

The machines offered for continuous pasteurisation are too large in size and too expensive. Something is wanted simpler in construction and lower in price. In the following note I shall describe an instrument which has been successfully used in several places.



A galvanised iron tank is constructed, long and wide enough to contain all the bottles of cream or milk to be pasteurised. This tank contains a false bottom, as shown in the picture. It will be seen that the false bottom creates three different levels in the tank, affording room for three different sizes. Furthermore, the false bottom is perforated in such a manner that the water in the tank can circulate freely. The tank is filled with water till it stands flush with the milk or cream in the bottles. The bottles are not closed, but the stoppers are placed loosely on top. No screw stoppers are used. Better than stoppers are the cardboard disks used to close the bottles and thrown away after use.

"A" is the steam inlet. The water is heated up slowly till about 195° Fahrenheit, and kept at that temperature for some time, say ten to fifteen minutes. Then the water is drawn off by means of a tap and cold water flows in for cooling. However, a too sudden change of temperature may crack the bottles, therefore it is advisable to add cold water before all the hot water has run off. Draw off this again and then bring in water which is as cold as obtainable.

If no steam is used the steam inlet is, of course, omitted in the construction, and then the tank can be heated by means of a spirit or paraffin oil stove. One thing to remember is that during the

process *the bottles must not be closed.* The stopper or paper disc is put loosely on top, and during the heating process some air will escape from the bottles. The moment cooling begins, the outer air rushes to enter the bottles and in so doing closes them automatically. A certain percentage of the bottles are likely to crack during the process, this depends entirely on the quality of the glass, the better the glass the smaller the breakage. The construction of this instrument is so simple that I think any tinsmith should be able to make it. The size, naturally, depends entirely upon the number of bottles to be pasteurised. The false bottom is loosely fixed in the tank so that it can be taken out for cleaning purposes.

THE TOBACCO SECTION.

HOW TO PRODUCE THE BEST BRIGHT TOBACCOS.

By J. van Leenhoff,
Chief of the Division of Tobacco Industry.

Suitable bright tobaccos in limited quantities are at present being produced by some farmers in certain districts, but it generally forms a very small proportion of the crop grown.

The percentage of good bright leaf can be enormously increased by—

(*a*) Sowing the proper seed.

(*b*) Up-to-date methods in the field and choosing suitable soil and manuring.

(*c*) Flue-curing the tobacco.

(*d*) Roughly sorting the tobacco on the farm.

(*a*) Sowing the Proper Seed.

All tobacco seed will not produce a bright tobacco. Special varieties and types exist for obtaining bright tobaccos. It has been my endeavour to import the best kinds of bright tobacco seed, to acclimatise them and select the finest strains, and also to select seed from some of the best yellow tobacco producing farms in the Transvaal. All these different types of seed have been given a trial, and the best seed kept for further selections. To farmers who have soil suitable for growing bright tobaccos and who wish to go in for flue-curing their tobacco (which process is strongly recommended) special seed will be issued for this purpose on application to the Tobacco Division.

It is also advisable to make seed beds in succession, *i.e.*, to sow enough seed every week so as to be able to harvest and cure the same quantity of leaf once a week. There will then be enough uniform ripe tobacco to fill the shed, and, as will be seen from the remarks in this article under the head "Flue-curing," by this process a more regular bright crop of tobacco will result.

(*b*) Up-to-date Methods in the Field.

It would take too long to discuss all these points in this article. Tobacco growers are requested to carefully study the tobacco articles appearing from time to time in the *Agricultural Journal*. The treatment of yellow tobaccos *in the field* is practically the same as for other tobaccos.

The following points may however be of interest:—

Soils and Manuring.—In the United States of America it has been found that the soil best adapted for the production of bright tobaccos is a gray, sandy or slaty top-soil with a yellow porous subsoil.

In the Transvaal, in the Rustenburg region (north of the Magaliesberg), some parts of the Pretoria and Waterberg districts, and in the south-east of Pietersburg, gravelly porous and light sandy soils are often found, and these soils, it is believed, are more or less suitable for the production of bright tobaccos. Some turf soils already produce yellow tobaccos, probably on account of their richness in lime, but the manufacturer prefers bright tobaccos grown on light gravelly and sandy soils, as the turf soils appear to produce a bad burning leaf.

On these poor open and sandy soils it is often difficult to maintain a sufficient supply of moisture necessary for the growth of the plants in the field, and therefore it must not be forgotten that these soils can be made the better able to retain moisture by green manuring and by the application of stable manure. If stable manure is at hand it is very desirable to make compost of it in advance. For bright tobaccos, if stable manure is to be applied, this must be done a season before planting the tobacco.

Many of the Transvaal soils need liming, and lime should be applied not only to provide plant food in itself but chiefly because it makes available any plant food that may be stored in the soil. Consequently, if lime is used it should be applied at least some weeks before transplanting. Lime is also necessary for the colour of the leaf. Soils poor in lime will not produce yellow tobacco.

Although Transvaal soils are, as a rule, not deficient in potash, yet potash will often work wonders in improving the burning qualities of the tobacco.

Potash should be used only in the form of sulphate, carbonate or nitrate of potash. Muriate of potash, which contains chlorine, should not be used, as it causes the tobacco to burn badly. Wood ashes contain potash in an available form, and are therefore also to be recommended.

For light and bright tobaccos nitrogenous manures should be used only in moderation. They have a marked effect in the production of nicotine, and make the leaf heavy and coarse, which should be avoided in this kind of tobacco. These manures also decrease the burning power.

Manuring all depends upon the composition of the soil, and I should strongly advise every tobacco planter to study the quality of his soil, and to take advantage of the Chemical Division of this Department by sending in a sample of soil taken in accordance with the printed instructions, which may be had on application. Careful attention should be paid to any advice given.

In the near future I propose to publish a more detailed article on the manuring of tobacco soils.

Preparation of Land and of Seed Beds.—This should be done, more or less, in accordance with the principles laid down in an article on tobacco which appeared in the *Agricultural Journal*, No. 23 (April, 1908).

Transplanting.—Plants when transplanted from the seed bed to the field should be set out in rows, the distance between rows being 3 feet, so that cultivation between the rows is possible.

The most suitable distance between plants cannot be definitely laid down, as this varies considerably according to the texture of the soil. However, it can be safely accepted that the distance should be, say, 18 inches or 2 feet between the plants. If white rust is to be feared, the distance could be increased to 3 feet, making it 3 feet between rows and 3 feet between plants. However, if possible, the tobacco should be planted more thickly, for closer planting produces a lighter texture and colour of leaf, and so increases the value of the leaf.

Insects and Fungus Diseases.—Every tobacco grower should possess a spray pump. As a preventive for insect pests and fungus diseases, the tobacco should be sprayed with paris green and bordeaux mixture, as described in Leaflet No. 1, published by this Division.

Cultivation.—The soil must be kept mellow, moist, and absolutely free from weeds: sometimes the weeds begin growing under the roots of the tobacco, where they cannot be destroyed by the cultivator. In this case hoeing must be resorted to, and this should be done as soon as the weeds appear. A perfect mulch should be kept on the surface all the time, never allowing it to become hard or crushed. By maintaining such a mulch, moisture is retained in the soil, consequently during a normal season practically no irrigation, or very little, is required.

The number of cultivations required after transplanting will depend a good deal on the season and conditions. It is impossible to state just how often one should cultivate; usually once a week is not too often. The land should be cultivated just as soon as possible after every shower of rain. The cultivator should have many teeth in preference to a few large ones.

When there is excess of rain on soils of heavy texture (*i.e.*, turf-soils), cultivation should not be applied too frequently, for working the soils under these conditions tends to increase its plasticity and tenacious character, resulting in hard clods.

Thorough cultivation is a most important matter, and I am afraid the majority of Transvaal farmers do not realise this. They appear to be under the impression that all that is necessary is to keep the field free from weeds, and although this must be done, yet the retention of the moisture in the soil is even of greater importance.

The soil must be worked a little round the plant at each cultivation. The ridges thus formed will be effective in keeping surface water from standing around the plant during excessive rains. They also assist the quick growth of the plant through nitrification, which causes quicker growth, and consequently a lighter leaf is produced, besides giving the plants greater power of resistance to severe winds.

Topping.—Plants should be topped low, *e.g.*, as soon as there are indications of the bud appearing. The bud must be nipped out with the thumb and forefinger.

Suckering.—After topping suckers will appear, and these must be nipped out every five or six days.

Harvesting.—When yellow spots begin to appear on the leaves, this is a sign of ripeness. When, in the middle of the day, on bending the leaf the rib cracks, the tobacco is ripe, and should be harvested.

If there is any doubt as to when the tobacco crop should be harvested, remember that it is always better to harvest a crop of bright tobacco too ripe rather than too green. Harvesting, either by picking the leaves separately or by cutting the plant, should never be started before the night dews have passed away, and not within twenty hours after rain has fallen.

When it is intended to flue-cure the crop, it is better to "prime," i.e., to harvest the tobacco leaf by leaf, so as to ensure every leaf being fully ripe. Bottom, middle and top leaves should be kept separate in the shed, and afterwards they should be baled separately, for by so doing the value of the tobacco will be greatly increased. The leaves are carried in baskets from the field to the shed, where they are tied on sticks (in exactly the same way as the cigar wrapper leaf is harvested at the Tobacco Experiment Station, Pretoria).

If the whole plant is to be harvested, which of course is much cheaper as regards labour, the leaves are not in the same uniform stage of ripeness as is the case when harvested leaf by leaf. The best time for harvesting the whole plant is when the middle leaves are fully ripe and the top leaves are showing the first indications of ripeness.

Two persons should work together when harvesting by the plant system, one, possessing a pair of shears (specially made for tobacco plant cutting, and obtainable in Pretoria), should cut off the plant near the ground, while the other person takes the plant and lays it carefully on the ground so as not to break the leaves.

The plants can then be strung on to laths provided for the purpose and carried into the shed if it be close at hand.

The best method of stringing the plants on to the laths is by splitting the stalk of the plant and running the lath through the same. For this work we have on our experiment stations a wooden tripod in which a lath is fixed, and on to the latter, at one end, a steel spike is fixed to split the stalk of the tobacco plant (see Plate No. 84). The tripod in question can be easily and cheaply constructed, and may be seen at our tobacco stations in Rustenburg and Barberton and Pretoria. On a lath 4 feet long 10 plants can be hung. By this means, and also with the aid of a tobacco wagon, there is no fear of the leaves being damaged. If the shed is some distance away the laths should be placed on a specially constructed wagon (see Plate No. 83). In this way breaking of leaves and darkening of colour through sweating is avoided, as always takes place. To carry tobacco in the old style is by loading the tobacco on a wagon like cabbages.

(c) Flue-curing the Tobacco.

The flue-curing of yellow tobaccos is practised in certain States in the United States of America, notably North Carolina and Virginia, and more recently in some parts of Europe and also in South Africa. The percentage of bright leaf in an air-cured crop is generally very small, and the right colouring will always be very uncertain. In addition the manufacturers state that the air-cured tobaccos is not so sweet as the flue-cured.

The principle of flue-curing tobacco is to start a slight fermentation in the leaf first through a gentle heat until the tobacco yellows. After yellowing the temperature is raised so as to dry out the sap, at the same time fixing the colour.

Plate 83. **A New Type of Tobacco Wagon.**

Tobacco Experiment Station, Pretoria.

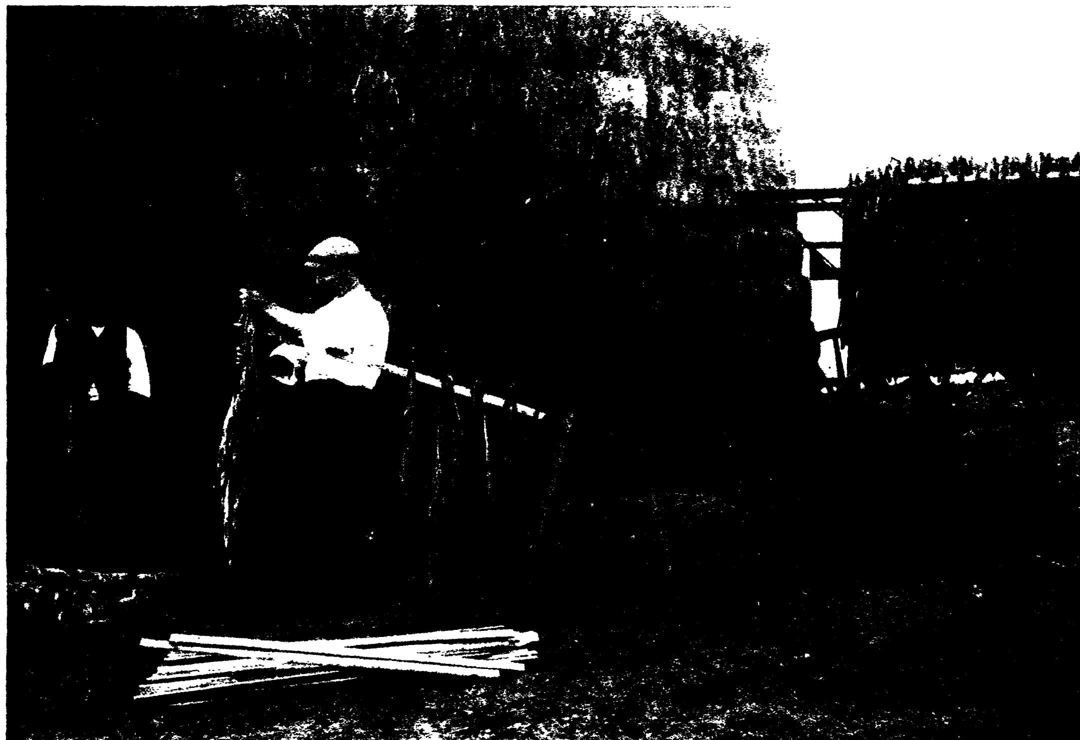


Plate 84.

"Spearing" Tobacco on Laths.

Tobacco Experiment Station, Pretoria.

Consequently flue-curing sheds are necessary for curing bright tobaccos, and as the latter are in great demand by the local and oversea dealers and manufacturers, we must do our utmost to increase the production of this type.

On our Tobacco Experiment Station at Rustenburg a flue-curing shed has been erected, and although the measurements of this shed are 24 feet x 24 feet x 24 feet, it may serve as a model for flue-curing sheds which the farmers may wish to erect. This shed is of the American pattern. For South Africa a smaller shed has been found more suitable. I would advise any farmers contemplating the erection of a flue-curing shed to construct it on the following measurements:—16 feet x 16 feet x 20 feet high.

The advantages to be derived from a *small* flue-curing shed of 16 feet x 16 feet x 20 feet high are the following:—

(1) For a shed of these dimensions only one flue is necessary.

(2) There will thereby be a great saving in fuel for obtaining the necessary temperature inside the shed.

(3) A small shed can be more easily and quickly filled and emptied.

In the Transvaal, the winter months—when there is not much other work to be done on a tobacco farm otherwise than preparing the tobacco seed beds and fields—is a good time for erecting tobacco buildings and for carrying out any necessary repairs to existing buildings.

Plans and specifications of such a shed are therefore given at the end of this article. It is probable that bricks would be the best building material to use in South Africa, but in the bushveld the sheds could be constructed of logs in the same way as is done in the United States, where timber is plentiful.

Filling the Shed.—When filling the shed with tobacco the top tiers should first be filled, and then the lower tiers in succession until the shed is full. It is a good plan to allow the plants to hang between the rows immediately underneath, not allowing them to touch.

All preparations must be made beforehand so that there is no delay in filling the shed, for this must be quickly done to ensure all the tobacco receiving exactly the same treatment, and the curing can start at once. It is a very bad plan to partly fill the shed and leave it overnight and continue filling next morning as this will result in discolouration. If some of the tobacco leaves are wilted whilst others are still fresh it is impossible to obtain a uniform bright colour.

A shed of the dimensions given in the specification in this article will hold four tiers of four rooms each. In each room 22 laths or stalks can be hung, say 8 inches apart, with about ten plants on each lath, the shed thus holding about 3,500 plants, and as the whole process of curing takes only five or six days, the shed can be refilled every week. This means that about 500 pounds of cured leaf can be obtained in one week, according to the kind of tobacco grown. It should take about four or five hours to fill the shed, and the door and all ventilators must then be tightly closed.

Regulating the Fire.—The fire must then be made in the furnace at the beginning. The best fuel to use is dry wood, of which a good quantity must be at hand so that the temperature is not interfered

with on account of the fire going low. For the higher temperatures green wood can be used. In districts where coal is cheaply obtainable this can also be used: it gives, if well fed, an even temperature.

Inside the shed, not too far from the door, a thermometer must be placed, or, better still, it should be placed in such a position behind a double-paned window that it can be seen from outside the shed to avoid opening the door. (See Plate 85.)

A slow fire having been started, the temperature in the shed must be slowly raised to about 90° Fahr. If a large fire is made up at first it will spoil the tobacco.

Yellowing.—Once reached, the temperature of 90° must be maintained until the tobacco yellows. The leaves take on an average 18 hours to yellow. If after that time the leaf has not commenced to change colour, the best plan is to supply some air moisture in the shed by throwing water over the floor and on the flues, thereby creating a supply of steam.

It must be remembered that in the process of yellowing for all tobaccos a certain amount of humidity is necessary. If the leaf is cured in a current of hot and dry air the water is quickly lost and the colour remains green on account of the action within the cells, and chlorophyl (green colouring matter) is not so completely destroyed as is the case when the leaf is allowed to die off slowly. (See "Tobacco Notes" in *Agricultural Journal* No. 17, pp. 31 and 32.)

If, as sometimes happens, after 24 hours the leaf does not yellow, then in all probability the desired colour will not be obtained, and the idea of producing this kind of tobacco should be abandoned. In this case what had better be done is to place the tobacco in an air-curing shed and let it dry in the usual way.

If, however, the leaf is ripe, and has been normally grown on a sandy soil, no difficulty will be found in flue-curing it, but if the plants have had a very slow growth and have become thick and coarse, it is often very difficult to obtain the bright colour.

Great care should therefore be bestowed on the culture of the tobacco in the field in order to obtain quick growing and uniformly developed plants.

If, on the other hand, the leaves should colour too rapidly and moisture appears on the leaf, ventilation is required and the door of the shed and the ventilators should be thrown open.

The nature of the processes which take place in the curing of tobacco have not as yet been definitely determined, but generally speaking the leaves lose about 80 per cent. of, what may be termed, their green weight, and a modification of the chlorophyl and other compounds present in the green leaf takes place. This results in a change of colour from green to yellow.

The principles of flue-curing and air-curing are practically the same in this respect, that care must be exercised to avoid admitting to the leaf excessive ventilation too soon before the leaf has obtained the desired colour (in this case lemon yellow) otherwise there is great danger that the tobacco will remain green.*

* I have been asked by several farmers why their tobacco kept the green colour, and the above explanation may be of use to them. Unripe tobacco, even with the best treatment in the curing shed, retains its green colour. There are varieties which change their colour more easily than others, for instance, we have yellow curing varieties and dark ones, etc.

Fixing the Colour.—When the leaf attains a greenish yellow colour, the temperature must be slowly increased, care being taken to ventilate the shed to provide an exit for the moisture. If the temperature is too low and there is humidity in the shed there is a danger of "sponge," *e.g.*, the development of ugly porous brown patches on the leaves, which causes enormous decrease in value. To avoid this danger ventilation and *slow* increase of temperature is necessary. When the door and ventilators have again been closed the temperature must be gradually increased to 100° Fahr. and this temperature maintained for about six hours, then raised at the rate of 2° per hour to 110°, and the latter temperature maintained for about three hours, then gradually raised at the rate of about 3° per hour up to about 120°. At this stage the leaf should be dry but the midrib is still moist, but in case the leaf is not dry the same temperature should be maintained until it is. The shed should then again be ventilated to allow the air moisture to escape, and after closing the shed tightly again the temperature to be raised at the rate of 5° an hour to 140° Fahr. The midrib should by this time have dried out, and the stalk itself must now be cured.

For this the temperature must again be raised, at the rate of about 6° per hour, to about 175° Fahr., great care being taken to see that the temperature is never allowed to exceed 175°, as with excessive heat in the last stage there is a danger of cooking or burning the tobacco. The temperature of 175° to be maintained until the stalk is thoroughly dry, which takes about eight hours. The door and ventilators must then be opened to allow the tobacco to cool off.*

Great care must be taken not to increase the temperature too rapidly after the required colour has been obtained, otherwise the leaf will change to a reddish colour. The temperature must be under absolute control, and not allowed to rise and drop.

In Rhodesia, where flue-curing experiments have been carried on during the past four years, some practical experience in this direction has resulted, and the following passages are taken from an article on the subject published in the *Rhodesian Agricultural Journal* some time since with regard to the danger of sponging and blotching:—

"As the heat increases the tobacco sweats (is covered with beads of moisture), and the result is that the novice again increases the heat in an attempt to carry off this moisture; the tobacco sweats still more, then heat is again increased until a point is reached where the surface of the leaf is cooked and it begins to 'blotch.' The term 'blotching' is used to describe the smooth, hard reddish-brown spots that appear on the leaf as the result of high temperatures. When the leaf blotches the beginner is frightened, and rapidly reduces his temperature, with the result that the warm leaf still sweats and sponging becomes general throughout the barn.

"The correct practice is to keep the leaf sweating, but to so regulate the temperature and ventilation that the moisture is carried off the leaf as rapidly as it appears, and at the same time to limit the

* *It must not be forgotten that the temperatures given above are approximate and only to be considered as a guide. Every planter must find out for himself the best temperatures with regard to his farm, crops, and general conditions.*

ventilation sufficiently to prevent the surface cells of the leaf from being dried out faster than they can draw moisture from the interior of the leaf. If these surface cells become dry at this stage the moisture cannot escape rapidly through them, but remains in the leaf, and at the slightly higher temperature to follow results in blotching. The leaf must sweat, but cannot do so in a very dry air, but if at the same time the air is over humid, oxidisation is rapid, and the leaf sponges. To state in another way, sponging is the result of moisture on the surface of the warm leaf; blotching is caused by failure of the moisture to escape and the cooking of that portion of the leaf by high temperatures, and is often induced by the drying out of the epidermis of the leaf at any of the previous temperatures. Sponging is prevented by ventilation and by the slow increase of temperatures; blotching is prevented by the same means, but in sponging the greater the ventilation the less the danger; in blotching, the greater the drying due to ventilation the greater the danger. To prevent both it is necessary to strike a happy mean, which is not difficult when all the leaf in the barn is of the same ripeness."

Taking the Tobacco Down.—After the fire has been taken out and the furnaces have become quite cool, the doors and ventilators are closed, and steam must be supplied in the shed to make the leaf again pliable so as to avoid breaking the leaf when taking the tobacco down, taking care, of course, not to supply too much moisture, which might provoke mould or might darken the leaf. This steam can be obtained from a small boiler,* which I strongly recommend every tobacco planter to purchase, so that he can take down his tobacco in the curing shed at any time he may wish to do so, thereby becoming independent of the very dry atmosphere existing in the Transvaal, which often renders it impossible to touch tobacco hanging in the shed for weeks or months together.

(*d*) Roughly Sorting the Tobacco on the Farm.

When the tobacco in the shed has been taken down the leaves should be stripped off the stalks, and the bottom, middle and top leaves kept separate. This tobacco can then be stored in small heaps before being sorted and packed. But if there is sufficient labour available the sorting and packing could be done right away.

To sort and pack tobacco well, and more especially bright tobaccos, one must possess a room which, first of all, admits the necessary light, but not direct from the sun's rays, so that the different colours can the better be distinguished; secondly, this room must be practically air-tight, so that the air moisture in it is independent of the dry atmospheric conditions. Lastly, but not least, it must be supplied with steam in case the tobacco is found to be insufficiently pliable for the work of sorting and packing.

In this article will be found a plan of an approved packing room. It is built against one of the walls of the shed. In the room is a box, supplied with steam by means of a perforated pipe, from the same boiler supplying steam to the shed. Above the pipe the tobacco

* This boiler can also be used for providing moisture in the air-curing shed when necessary for instance, once every 24 hours during the first stage of air-curing so as to obtain good colour according to the principles explained in my previous articles. In other countries a boiler is often brought into use for sterilising the seed beds, *i.e.*, to kill the germs existing in the soil so as to prevent certain diseases.

is hung on laths or sticks, the leaves not being allowed to touch the pipe; the lid of the box can be closed and the steam allowed to spread through the box. This box can also be used for damping the laths filled with tobacco just coming from the shed, so that the leaves will more easily strip off, and also afterwards before packing in bales when the tobacco has been made into hands.

After the lid of the box has been closed for a few seconds and the tobacco taken out the leaf will become moist and pliable, but as soon as it has cooled off it will again become brittle and dry, so that this work must be necessarily hurried. Care must be taken that the tobacco is not moist when cooled off when packing, otherwise there is danger of darkening the leaf.

A table is placed in the room on which the leaf can be sorted both as regards the length of the leaves and the colour, and if the tobacco is properly sorted the manufacturer will naturally pay higher prices than he will give for unclassified leaves.

SPECIFICATION—FLUE-CURING SHED.

See Plate 85.

The inside dimensions of the building are:—16 feet x 16 feet x 20 feet high. The foundation can be made of stones, concrete or hard blue bricks in cement, 2 feet wide, and top of foundation about 6 inches or more above the highest point of the ground.

The walls to be built of raw or burnt bricks, 14 inches thick. The mortar can be lime and sand, or red dagga. In case the walls are built with raw bricks and red dagga, the outside will have to be plastered with lime mortar. The arches above windows and doors to be three rings high, and if wider than 3 feet to have camber bars Hoop iron to be built in to secure the roof timber to the brickwork.

The floors in the building, if required, can be made of hard bricks in sand.

The roof timber to be as follows:—Joists, struts, wallplates, posts, rafters, etc., 4½ inches x 1½ inches; purlins 2 inches x 3 inches; ridge 1 foot x 9 inches; the whole covered with galvanised corrugated iron No. 24 and 18 inches ridgings, facias 1 inch x 6 inches. The principals to be well bolted and spiked together. Gutters and down-pipes to be used if required, but these are not essential if the iron laps far enough over the walls.

The door, 3 feet x 7 feet of deal or flooring-boards and turning outside, hung to a frame out of 3 inches x 4½ inches, or 3 inches x 6 inches. In the gables two ventilation frames so constructed that it will be possible for a man standing outside the building to open and close such ventilators.

At the bottom of the walls also three ventilators are needed as plan indicates.

The door in the sorting-house to be constructed in the same way as the door in the barn, and the windows to be made or stock windows to be used.

The framework in the barn must be made according to the plan attached.

In the barn an iron pipe 12 inches or 15 inches wide has to be laid about 4 inches from the floor, starting in the fireplace and ending

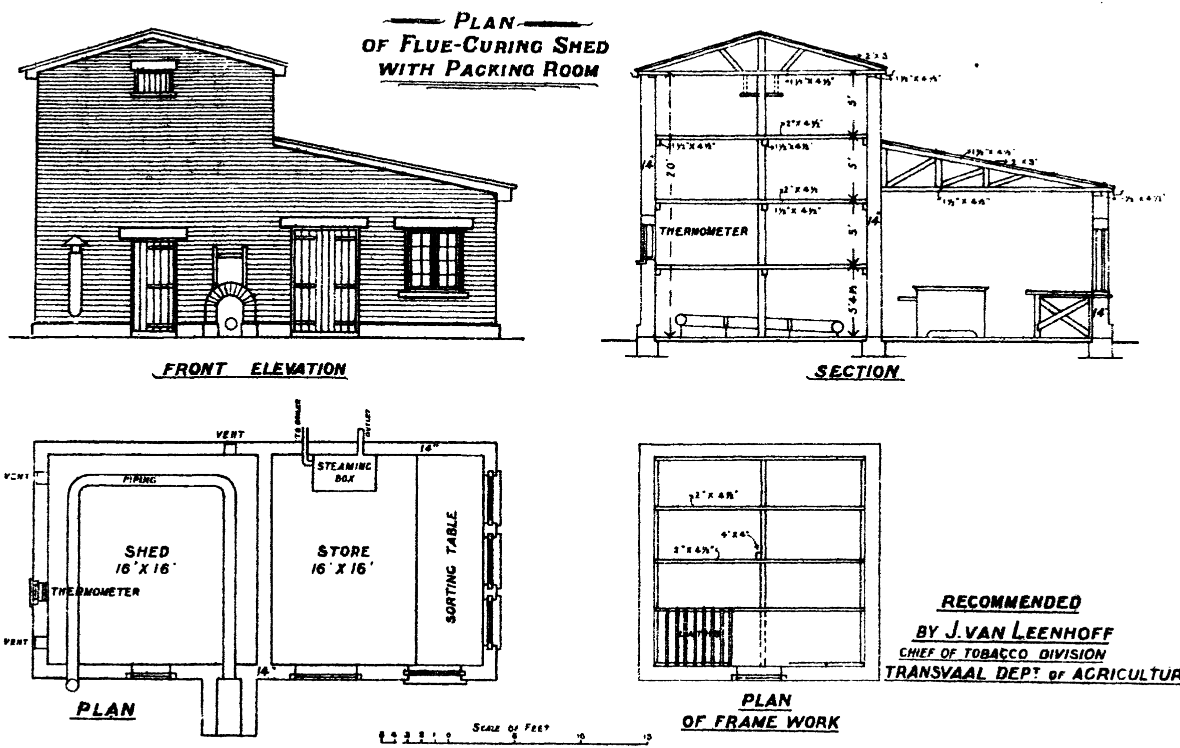

PLAN
OF FLUE-CURING SHED
WITH PACKING ROOM
FRONT ELEVATION
SECTION
THERMOMETER
PLAN
VENT
PIPING
SHED
16' X 16'
THERMOMETER
STORE
16' X 16'
STEAMING BOX
SORTING TABLE
14"
PLAN
OF FRAME WORK
SCALE OF FEET
RECOMMENDED
BY J. VAN LEENHOFF
CHIEF OF TOBACCO DIVISION
TRANSVAAL DEPT OF AGRICULTURE

Plate 85.

in the same wall and brought up about 8 feet high along the outside wall. This pipe to be well secured with iron ties on to the wall.

An iron slide to be made as shown in the plan.

In the outside wall a small window to be made to give view of a thermometer to be hung so that the temperature of the shed can be seen from the outside.

In the sorting-room a table will be constructed for sorting tobacco.

A box for moistening tobacco by means of steam from a small boiler will also be made in this room.

All woodwork should be painted with carbolinium.

NOTES ON TRANSVAAL TOBACCO PESTS.

By C. W. Howard, B.A., F.E.S., Government Entomologist.

In the Transvaal very little attention has been given to insects which attack tobacco. It seems advisable, however, to place what information we have at the disposal of tobacco growers in the hope that it will result in the increase of our knowledge of these insects.

The tobacco plant in the Transvaal does not seem to have as large a number of serious pests as is the case in many other countries. There are only three which we need consider as at all serious. The *cut-worm* is the first to appear early in the spring, soon after the plants are set out, but fortunately we do not have it with us every year. The *split-worm* appears not only in growing plants, but in the seed beds also. Its damage may be very great. I have seen fields of tobacco in the Transvaal where fully thirty per cent. of the plants were ruined by this insect. The *Nematode*, which attacks the roots, and which is commonly called *gall-worm* or *eel-worm*, also does an immense amount of damage. The areas where it is common, however, are isolated, and it is not spread over the whole country.

The cut-worm, split-worm and gall-worm are common pests of other plants than tobacco, and remedial measures must also be used in connection with these plants if success is to follow any efforts to keep them in check. The gall-worm attacks a large number of field and garden crops, but more especially tomatoes and potatoes, besides tobacco. The split-worm is also a serious enemy of potatoes, while the cut-worm will destroy almost any crop. (Plate 81.)

The Split-Worm, *Phthorimaea operculella* (Zeller).

This is an European insect which has spread over many parts of the world. It is now found in America, Australia, New Zealand and Northern Africa, as well as in South Africa. Its principal food plant seems to be potatoes, and it is undoubtedly with potatoes that it has spread from its original home.

In potatoes the worms eat through and through the tubers, which eventually they completely destroy if left long enough. The greater part of the injury is done to stored potatoes, which have become infested

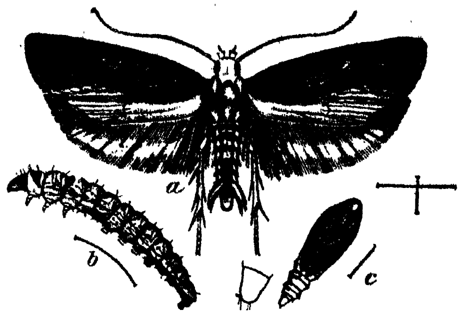


Fig. 1. Tobacco Split-Worm.
a Moth. *b* Caterpillar. *c* Pupa.
From *Farmers' Bulletin*, U.S.A. Dept. of Agr.

before storing, and in which the insects continue to develop. Worms may also be found in stems and leaves of growing potatoes. With tobacco the injury is of two sorts. When the worm enters the stem of a growing tobacco plant, it eats out the interior and causes a gall like swelling at, or just below, the crown. The leaves remain small and stunted, and the plant never shoots up into a vigorous and healthy form. Frequently, such a distorted plant makes an attempt to overcome the injury by sending up two or three side shoots. At other times the caterpillar enters the leaf of the tobacco plant instead of the stem. In such a case it eats out irregular areas in the tissues between the two surfaces of the leaf, also causing swellings and distortions wherever this mine approaches a large vein. This habit of mining out the leaves has given it the name of "tobacco split-worm" or "leaf miner."

The moth which produces the worm is a small greyish creature of about ⅜ of an inch in length. The eggs are laid by the moth upon the leaves and stems of the tobacco and potato plants. (Fig. 1.) In the case of the latter, however, it will also lay its eggs upon growing tubers exposed above the surface of the soil, or upon the tubers at the time when they are exposed whilst digging, or after they have been placed in storage. The caterpillars, when full grown, are of a pale yellowish colour, and may reach to half an inch in length. If disturbed, the caterpillars may leave the plant and form a burrow elsewhere. It is also known that they will leave a place of their own accord and crawl about until they find another suitable place to begin work again.

Advantage may be taken of this habit of the larva issuing from its burrow and wandering about the plant to make use of the arsenical spray. Paris green is perhaps the most convenient form in which to apply this spray, but, in spraying potatoes, if any of the fungus diseases or blights are present the Paris green can be profitably combined with Bordeaux mixture. All infested plants in the field should be dug up and destroyed to prevent the increase of the insects present, as there are at least two generations each year, and probably three or four in our warmer districts.

Plate 81. **Tobacco Pests of the Transvaal.**

a. Tobacco root affected with Eel-worm.
b. Tobacco stem with gall produced by Split-worm.
c. Tobacco seed-pods eaten by Bud-worm.
d. Green bug enlarged.
e. Green bug natural size.
f. Curculio beetles natural size.

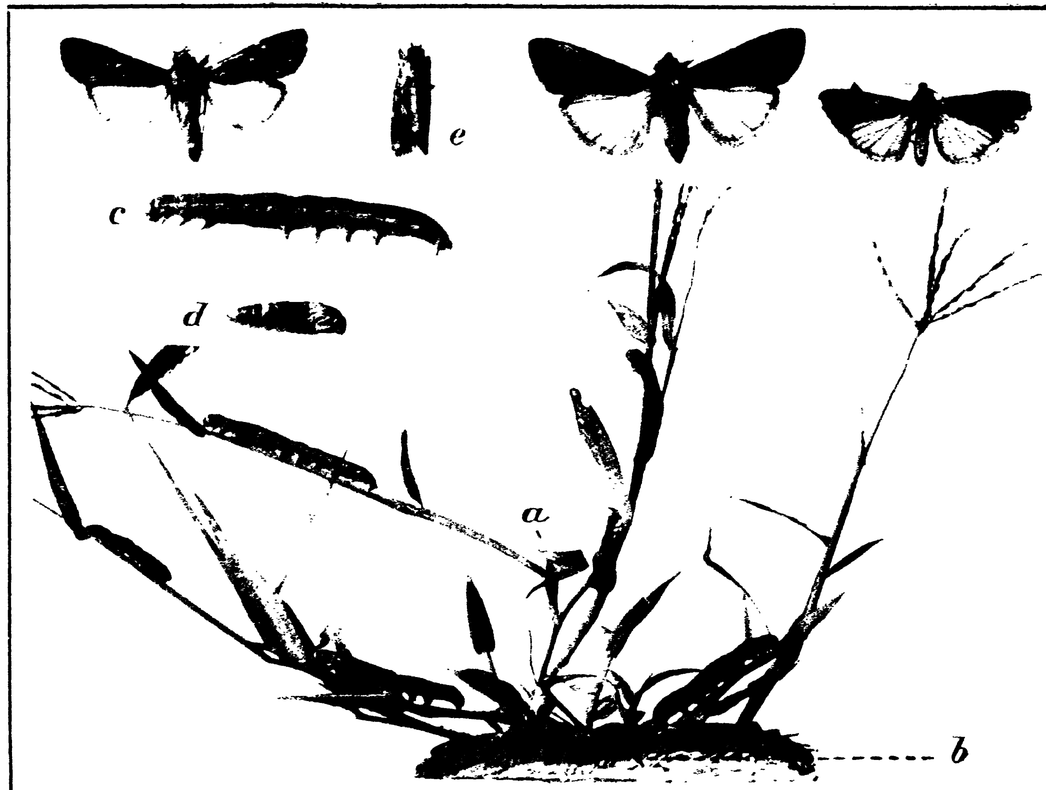


Plate 82.

The Pigweed Caterpillar.

(*Caradrina exigua* and *C. orbicularis.*)

a. Worms on sweet grass. *b*. Worm curled up, having dropped off the grass, as it does when disturbed.
c. Worm. *d*. Pupa. *e*. Moths.

The split-worm also attacks the young plants in the seed beds, and great care should be taken to see that the seed beds are covered to prevent the access of the moths to the plants.

If potatoes are grown near the tobacco field, or on the same farm, these precautionary measures must not end with the tobacco, but must be extended to the potatoes, as there is little doubt but that the infection of tobacco fields may originate from the potatoes.

Only potatoes free of the pest should be planted. After planting, care should be taken that the soil is kept loose and tubers all well covered. If the tubers are exposed, moths will oviposit on them. If the worms are very abundant, it might pay to pull out and destroy badly infested plants, at the same time employing the Paris green spray on those remaining.

The greatest good can be done, however, by giving attention to preventive measures. At the time of digging, all wormy potatoes should be rejected and destroyed, and the remainder should not be allowed to remain exposed any longer than possible. If it is impossible to place the potatoes under cover before nightfall, they should be at least bagged and stacked, covering over the whole with a buck sail. Unless the sail is placed over the stack, the moths will gain access to the potatoes and lay their eggs upon them. After entering the store-room every precaution must be taken to prevent the access of moths. If the room is not perfectly tight, moths will certainly find a place of entrance. If an open place is employed, the bags should be carefully covered with a buck sail. If moths are already present in the store-room, it should be fumigated or moths killed in some other way. Only sound potatoes should be planted.

* * * *

GALL-WORMS (*Heterodera radidicola*).

This pest is of even a more serious nature than the split-worm. Owing to the minute size of the creature, the ease with which it is transported, and the large number of plants which it attacks, it is very difficult to combat. Extensive experiments are being carried out by this office to ascertain the easiest and cheapest methods of controlling it, and a full report will soon be issued.

It would take too much space to enumerate the food-plants of this worm, but in the Transvaal it is potatoes, tomatoes and tobacco which are mostly attacked. On potatoes the presence is shown by knotty growths or rounded pea-like swellings on the roots, or by the pimply appearance of the tubers. On tomatoes and tobacco its presence is shown by the knotty growth on the roots and the presence of the rounded galls on the fine rootlets. The plants affected become stunted, and in the end may shrivel up and die.

The gall-worm is a very small, elongate spindle-shaped creature, so small as to be seen only with a good lens. It belongs to a group of creatures known as *Nematodes*, and is related to the vinegar eel and some of the worms which are parasitic in the alimentary canal of man and the domestic animals. When the female gall-worm reaches maturity, she assumes a spherical shape, so swollen is she with eggs. It is this

female form which casues the pimply appearance of potatoes and the galls upon the tobacco roots. If a gall is split open, the female can easily be seen inside, like a very tiny pearl. Undoubtedly the gall-worms live in many of our wild veld plants, especially those related to potatoes and tomatoes. Fields may also become infested from planting infected potatoes.

When a field becomes infested no more tobacco should be planted upon it for some seasons. Many suggestions have been made whereby the land might be cleaned by using various commercial fertilizers or certain chemicals, but undoubtedly the best plan is to starve out the pest by allowing the field to remain fallow for one or two years. During this time it should be kept perfectly clean of all weeds and other plants, otherwise the worms will find some in which to feed and multiply. There are two alternatives to this. To plant the field with a crop which the eel-worms will not attack, or to plant a crop—such as potatoes—of which they are fond, and as soon as they are full of worms to dig them up and destroy by burning. It is impossible to say at the present time what crops it would be profitable to plant which will not be attacked.

By far the safest plan is to allow the field to lie fallow, planting the tobacco in a new place. In the course of two years the worms will be starved out, and the original field can be used again.

Great care should be exercised in preparing the seed beds so that only clean and healthy plants will be available for planting. Unless soil positively known to be free from gall-worms is available for seed beds, it should be sterilized by baking before planting the seed. In America the soil is burned. In order to accomplish this burning, the soil is first laid with poles in order to keep the burning wood off the soil and admit the air. Upon these poles the wood is piled and the fire started on the leeward side, so that the progress may not be too rapid. A slow fire will convert all the moisture in the surface soil to steam, and thus kill any living creatures. The fire is continued long enough to convert all the moisture in the first three or four inches of soil to steam. The use of steam instead of fire has been tried for the preparation of the seed bed, and has proved very satisfactory. The steam does not destroy the combustible portions of the soil, while it destroys all seeds and insects.

THE CUT-WORMS (*Noctuidae*).

These are the earliest pests to be noted after the plants have been set out. The worms are large, fat, greasy looking caterpillars of a dark greyish or brownish colour, and measure from one to two inches in length. They spend the day concealed in the soil near the plant, emerging during the night to do their work. When disturbed they curl upon themselves, covering the head with the tail. (Fig. 2.)

These worms cut off the plant at its base, either just above or below the surface of the soil, or when the plant is very small they may devour it entirely. If cut-worms are suspected of being present in a tobacco field, it should be cleared of them before the plants are planted out. This can be done as follows:—

Cut some green forage, lucerne or other green plants, dip them in a solution of Paris green; say, a couple of spoonfuls to a bucket of water.

This forage can then be spread about the field at intervals and in little bunches. If no other food is present the cut-worms will come to this

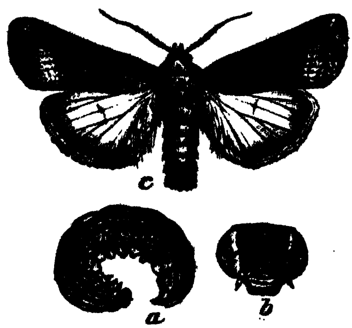


Fig. 2. A Cut Worm.
a—Caterpillar or worm. *b* Head of caterpillar. *c*—Cut worm moth.
From *Farmers' Bulletin*, U.S.A. Dept. of Agt.

bait, eat it, and perish. The bait should be put out just before nightfall, and all animals should be kept away.

The best factor in keeping down cut-worms is to plough the field in early winter so as to kill the worms which are spending the winter in little cells in the soil. If the land lies fallow all the winter, there will be no food for the worms to eat when emerging early in spring, and no plants upon which moths may lay their eggs. Clean culture during the summer, keeping the land free of all weeds, also helps to drive the worms to richer pastures.

In other countries suggestions have been made, such as making paper or metal cylinders about each plant when it is first set out, pressing the cylinder into the soil, and thus preventing the approach of the worms. Such a method is, however, expensive and cumbersome, and it is better to rely on the early winter ploughing and poisoned bait. It must be borne in mind, however, that cut-worms attack many other crops besides tobacco, and remedial methods must not be confined to this one crop if success in combating it is hoped for.

* * * *

The Bud-Worm (*Heliothis armiger*).

This is another insect of almost universal distribution, and which attacks a number of crops, such as cotton, maize, and tomatoes. In the Transvaal we have noticed its presence in tobacco on only a few occasions, and then it did not seem to be doing any serious injury. (Fig. 3.)

The caterpillars are rather large, nearly two inches in length, and usually of a light or dark green colour, with darker longitudinal stripes. Early in the season these caterpillars may eat into the tender buds, thus destroying many leaves; indeed a caterpillar may often entirely consume the bud. Later in the season it may bore into the seed pods, destroying their contents.

The pupa spends the winter in the soil, and may be easily destroyed by the early winter ploughing recommended for the last-mentioned insect.

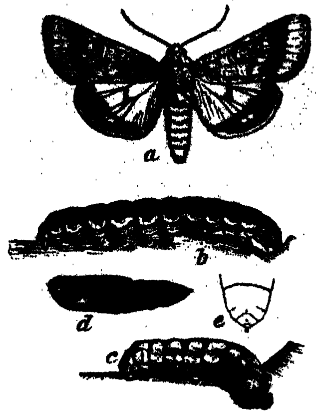


Fig. 3.—Bud Worm.
a—Adult moth. *b* and *c*—Caterpillars. *d*—Pupa.
From *Farmers' Bulletin*, U.S.A. Dept. of Agr.

The lands must also be kept free from all weeds which the caterpillars eat, and it is well not to have mealie lands, tomatoes and Cape gooseberries near to the tobacco lands. Hand picking may suffice in small lands, while in larger ones a Paris green spray will destroy the caterpillars.

THE PIGWEED CATERPILLAR (*Caradrina exigua*).

This is still another cosmopolitan insect, which, in South Africa, after a dry season often appears as an army worm. During the past summer after the long continued drought, this worm appeared in hordes in many parts of the Transvaal and Natal, moving along like swarms of voetgangers, eating off all grass and many crops before them as they moved. In 1906 during a period of drought it also appeared, not as an army worm at that time, but as a bad pest of cotton, tobacco, potatoes, beets, gum trees, and vines. Its favourite food-plant at that time seemed to be the wild pigweed or mist-brede (*Amaranthus paniculatus*) which grows so profusely about old kraals. For this reason it was christened the *Pigweed Caterpillar*. (Fig. 4.)

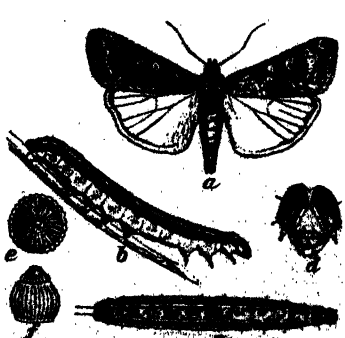


Fig. 4.—Pigweed Caterpillar.
a—Adult moth. *b* and *c*—Caterpillars. *d*—Head of caterpillar.
e and *f*—Eggs.
From *Bulletin 57*, U.S.A. Bureau of Entomology.

The injury by this caterpillar to tobacco consists in defoliating the plant. For their destruction a spray of Paris green is effective. The caterpillars may reach a length of one and a half inches or more, and vary in colour from a slaty grey to a dark green, with a lighter band down each side.

Horn-Worms or Hawk Moth Caterpillars (*Sphingidae*).

In most tobacco countries members of this group attack tobacco, often becoming a serious pest. So far we have never found them on Transvaal tobacco, but as we have many species here, it will be a wonder if some of them do not develop a taste for tobacco. The worms are very large caterpillars, often reaching a length of four or five inches, and the thickness of one's finger. Their colour varies, some being a sober brown or green and others of a very light colour. The name Horn-Worm is given to this creature because of a long horn on the rear end, which, by the way, is quite harmless. The adult moths are seen just at sundown hovering over flowers, from which they suck the nectar. Their flight is very rapid, and the wings move so rapidly as to be almost invisible, emitting a loud humming sound as they hang suspended over a flower.

* * * *

Aphis or Green Fly (*Aphidae*).

These small lice-like insects, which are often present in such numbers on the underside of the leaves of tobacco plants, may cause considerable injury. The aphids are sucking insects and deprive the plant of large quantities of its sap, thus hindering its growth and frequently causing the leaves to turn yellow and wither.

They are most numerous during the seasons of small rainfall. Heavy rains wash off and destroy so many of them that their injury is not noticeable. But as they reproduce so rapidly it takes only a short time for the plant to become covered again, and the grower must resort to a spray of soap or paraffin emulsion to keep them in check. These sprayings must be repeated as often as the aphids become abundant.

* * * *

Green Bug (*Nezara Viridula*).

This large, flat, triangular green bug is well known to farmers in the Transvaal. It is present nearly everywhere, but seldom does much injury to crops. Its food habits are varied, attacking nearly every sort of plant and tree, and even such as castor oil. Although often present on tobacco in rather large numbers, it is hardly necessary to take it into consideration when discussing the insect pests of tobacco. If it is so abundant as to become a source of danger, hand picking should be sufficient to check it. Clean culture and allowing the lands to lie fallow and free of all plants, weeds, and rubbish over winter are also measures which should be adopted.

* * * *

Curculio Beetles (*Peritelus ornatus and Strophosomus sp.*).

These two small beetles, the first of which is of a light brownish grey colour, with several short white streaks on its wing covers, while the second is of a general light yellowish brown with indistinct darker stripes, often

attack tobacco, eating away portions of the leaves. We know nothing of the life histories of these beetles, except that they frequently also attack cotton and several wild plants. Paris green or hand picking are the most practical measures to adopt for their suppression if they become numerous.

HOW TO MAKE THE SPRAYS RECOMMENDED.

1. Paris green may be applied in either of two ways :—

(a) The liquid spray, or (b) Dry.

In making the spray the Paris green is mixed in the proportions of 1 lb. to 150 to 200 gallons of water, to which should be added 2 lbs. or 3 lbs. of freshly slacked stone lime. As the Paris green is insoluble in water, the mixture must be frequently stirred to ensure an even distribution. To apply dry, the Paris green should be mixed with flour or air-slacked lime, in the proportion of 1 lb. of Paris green to 10 lbs. or 20 lbs. of the lime or flour. The lime should be carefully sifted through a fine sieve before mixing to ensure its not being coarser than the Paris green. The application can be made by placing the mixture in a coarse canvas bag, and sending a boy with one of these in each hand, or suspended from a rod over his shoulder, up and down the rows of tobacco. A slight jar will cause the contents to sift through the bags and over the plants. By using the two bags two rows of plants can be done at one time, and thus hasten the work.

Some people prefer to use a machine which is devised so as to throw the Paris green evenly in a fine mist over the plants.

Paraffin Emulsion.

The Paraffin Emulsion is made up as follows :—

Hard soap, 1¼ lbs.
Paraffin, 4 gallons.
Water, 2 gallons.

Cut the soap into small pieces and boil until dissolved in water. Add the boiling solution to the paraffin and at once churn the mixture and keep it violently agitated for ten minutes ; five minutes will suffice if a small hand pump is used to pump the liquid quickly backwards and forwards. When it can be done without danger of the oil taking fire, it is well to heat the oil beforehand or keep the mixture over the heat while it is being agitated. A uniform milky emulsion is thus produced, which becomes semi-solid on cooling.

When properly made the solution will keep for a long time. It should be diluted with from nine to fifteen parts of water, depending upon the tenderness of the plants to be sprayed. The water and the emulsion must be thoroughly mixed. Soft water should be used both in preparing the emulsion and in diluting it.

Soap Spray.

Soap, 1 lb.
Water, 2 gallons.

Blue-mottled, sunlight or soft soap may be used in preparing the spray. The soap should be cut up fine and dissolved in boiling water.

USEFUL FACTS AND FIGURES FOR FARMERS.

DRY SALTING BACON AND SIDES.

For hogs weighing not over 125 or 130 lbs. each, intended for dry curing, one bushel fine salt, two pounds brown sugar, and one pound saltpeter will suffice for each 800 lbs. pork before the meat is cut out; but if the meat is large and thick, or weighs from 150 to 200 lbs. per carcass, from a gallon to a peck more of salt and a little more of both the other articles should be taken. Neither the sugar nor the saltpeter is absolutely necessary for the preservation of the meat, and they are often omitted. But both are preservatives; the sugar improves the flavour of the bacon, and the saltpeter gives it greater firmness and a finer colour if used sparingly. Bacon should not be so sweet as to suggest the "sugar cure," and saltpeter, used too freely, hardens the tissues of the meat, and renders it less palatable. The quantity of salt mentioned is enough for the first salting. A little more new salt is added at the second salting and used together with the old salt that has not been absorbed. If sugar and saltpetre are used, first apply about a teaspoonful of pulverised saltpeter on the flesh side of the hams and shoulders, and then, taking a little sugar in the hand, apply it lightly to the flesh surface of all the pieces. A tablespoonful is enough for any one piece.

If the meat at the time of salting is moist and yielding to the touch, rubbing the skin side with the gloved hand, or the "sow's ear," as is sometimes insisted on, is unnecessary; the meat will take salt readily enough without this extra labour. But if the meat is rigid, and the weather very cold, or if the pieces are large and thick, rubbing the skin side to make it yielding and moist causes the salt to penetrate to the centre of the meat and bone. On the flesh side it is only necessary to sprinkle the salt over all the surface. Care must be taken to get some salt into every depression and into the hock end of all joints. An experienced meat-salter goes over the pieces with great expedition. Taking a handful of the salt he applies it dexterously by a gliding motion of the hand to all the surface, and does not forget the hock end of the bones where the feet have been cut off. Only dry salt is used in this method of curing. The meat is never put into brine or "pickle," nor is any water added to the salt to render it more moist.—("Home Pork Making."—A. W. Fulton.)

A HOME-MADE TARPAULIN.

A rain-proof tarpaulin may be made in the following simple manner:—When your canvas is put together, take two parts of Stockholm (not coal) tar, and one part of neatsfoot oil. Do not use linseed oil or you will harden the canvas. Heat the oil by itself to boiling point, then add the tar and stir well. Apply with a wad of oakum or soft rag. A brush is not so good. Rub the mixture well in. It will take some time to dry, but the tarpaulin will be soft, limp, and rain-proof.—(*Queensland Agricultural Journal.*)

CHOKING CATTLE.

Every cattle raiser should have on hand a piece of stiff rubber hose about four feet long for use as a probang when cattle get choked. Whenever any food sticks in a cow's throat a piece of lard about the size of a hen's egg should be introduced. The warmth of the throat will melt the lard and lubricate the throat and often enable the cow to get rid of her difficulty. If this fails a clevis—or anything made for the purpose—may be inserted in the cow's mouth in order to keep her teeth apart. The hand and arm are then greased and shoved down her throat to remove the obstacle. It this is unsuccessful, the probang* may be put into the throat and the obstacle pushed down to the stomach. This will usually be successful. A wilted turnip is one of the worst things to stick in a cow's throat. The probang is about the only remedy. A broomstick or other stiff article if used for this purpose is likely to perforate the gullet and kill the cow. Soap and milk poured down the throat will sometimes give relief. More than a pint should never be used.—(" Profitable Dairying."—C. L. Peck.)

RINGING A BULL.

It is preferable to ring a bull when he is a yearling, as it is easy to hold him at this time with a common halter. Do not cut a round piece out of the nasal septum, or burn a hole through it, as that would probably injure the sense of feeling in the nose, besides being cruel. Use a common trocar and canula for punching the hole and holding it in shape for the ring. It is difficult to insert the ring after punching the hole without the use of the canula, as the holes through the cartilage and skin in the nose are not opposite. A copper ring, hinged in the centre, with a screw to hold it together after insertion, is commonly used. It makes little difference what time of year is selected, except that any operation is better performed in cool weather, when there is no danger of irritation by flies. Nose-ringing a bull has no effect whatever upon his disposition, its sole purpose being to furnish a means for handling him with ease and safety.—(*The Rural New Yorker.*)

TICKS ON DOGS.

Valuable dogs are often killed owing to the attacks of scrub (not cattle) ticks. If the ticks are promptly removed, a dog will usually recover, but if they are not detected the animal rarely survives. In the case of woolly-haired dogs the insects are difficult to find, in which case the dog may be sheared and the ticks removed. They should not be forcibly pulled off, as the mandibles are invariably left in the animal's skin, and the mischief goes on. Insects breathe through their bodies, hence, if the pores are closed by the application of oil, turpentine, or

* A slender elastic rod with a sponge on the end.

Plate 89. **Prize Collection of Farm Produce.**

Grown by Mr. S. Hosken, Heidelberg.

Exhibited at the Witwatersrand Agricultural Show.

Plate 90. **Dry-land Produce from the Government Stud Farm, Standerton.**

Exhibited at the Witwatersrand Agricultural Show.

Plate 91. **Produce from the Government Experimental Farm, Potchefstroom.**

Exhibited at the Witwatersrand Agricultural Show.

kerosene, the tick dies, and may be extracted entirely. If the ticks cannot be found, the following dressing will be of some service :—

Soft soap, 4 oz.; kerosene, 1 teacupful; water, 1 quart. Boil the soap and water together until the soap is dissolved. When cool, add the kerosene, and agitate the mixture thoroughly for five minutes with a rod. Wash the dog all over with some of this mixture. Give internally 3 to 10 gr. of iodide of potassium in 2 tablespoonfuls of water.—(*Queensland Agricultural Journal.*)

RING-WORM IN CATTLE.

Ring-worm in young cattle can be cured by thoroughly cleaning the parts with tar soap and warm water, and then painting all affected parts with a saturated solution of iodine. May need a number of applications. —("Minnesota Farmers' Institute Annual.")

PROBLEMS IN DAIRYING.

I.—To find the quantity of milk required to make 1 lb. of butter. If 12,000 gallons produce 5,114 lbs. of butter, how much milk is required to make 1 lb. of butter?

1st.—5,114 : 1 : : 12,000 : x = 2.3 gallons.

2nd.—4,263 : 1 : : 9,000 : x = 2.1 „

II.—Given 50 gallons of milk at a temperature of 80 deg. Fahr. If 10 gallons are taken out, what temperature must this be heated to in order to bring the whole body of milk up to 84 deg. F.

Multiply the number of gallons by the difference in temperature, divide by the number of gallons taken out, and add the answer to the first temperature. Thus :—

$$\frac{50 \times 4}{10} + 80 = 100 \text{ deg. F.}$$

SOUR SILAGE.

Sour silage has a pale green colour, and should have a pleasant vinous aroma, with a slightly acid flavour. Dairymen favour this sort for milk production. (1) The crop requires to be cut when full of succulence, often when just a little immature. (2) It must be carted and siloed directly after cutting. (3) Silo must be filled rapidly and thoroughly tramped all over. (4) The temperature should be kept at from 90 deg. Fahr. to 120 deg. Fahr.; but the lower temperature is most in favour. To keep in the region of the nineties, quick filling and trampling must be resorted to, whilst above, from 100 deg. Fahr. to 120 deg. Fahr., the filling may proceed each day. To lower temperature when filling, mass must be consolidated by trampling, and then add more silage. If full, and the temperature is rising, lay down some bagging, and put on a layer of earth or handy weighing material, allowing it to remain.

4

SWEET SILAGE.

In appearance, sweet silage should be of a nut to dark brown colour, and have a rich fruity, somewhat alcoholic aroma. (1) The crop must be cut when succulent; (2) the process of filling must go on gradually, so as to allow the temperature to rise; (3) the temperature may rise from 120 deg. Fahr. to 150 deg. Fahr.; (4) best results are obtained at temperatures ranging from 130 deg. F. to 140 deg. F. It is often necessary to fill on alternate days, or else to arrange for the crop to lie for a few hours, or overnight in the field, before carting it in. Sweet silage may be made from wilted maize or sorghums which have gone beyond the usual succulent period, but as the temperatures usually run high it is necessary to apply pressure. In a sectional view of a stack the lower layers are of a pale-green colour, and may be classed as "sour." This is accounted for by the exclusion of the air, due to the weight of stuff above. The silage gets darker in colour as the temperature rises in the higher layers. At 160 deg. Fahr. it becomes almost black or "mow" burnt, and then deteriorates in quality.—("The Dairying Industry."—G. S. Thomson.)

AMOUNT OF SILAGE PER DAY.

A cubic foot of silage properly compressed runs from 35 lbs. to 40 lbs. in weight, and sometimes over; thus a ton will occupy some 50 cubic feet. If a cow has access to other feed, a cubic foot per day will suffice, but when silage only is reckoned upon to supply the bulk so necessary for ruminant animals, 50 lbs. are required.

RECIPES FOR LIMEWASHES.

I.—20 lbs. lime (unslaked), 3 lbs. common salt, ¼ lb. alum. Slake the lime with boiling water until the consistency of the wash is similar to rich milk. To increase its antiseptic properties, add ½ pint of crude carbolic to each bucketful of wash.

* * * *

II.—To half a bucket of lime, add two handfuls of common salt and two handfuls of tallow, or, better still, soft soap, at the rate of 2 lbs. to 30 gallons of wash. Slake slowly, stirring all the time.

This quantity will make two bucketfuls of wash. Very adhesive and unaffected by rain.

* * * *

III.—Slake lime with water, and add sufficient skim milk to bring it to the thickness of rich milk. To each gallon add 1 oz. of salt and 2 ozs. of brown sugar, dissolved in water.

Before applying these washes to wooden, metal, or stone structures, clean the surfaces of foreign matter, thus increasing the benefits of the solution. Care should also be taken to bring all crevices under the influences of the antiseptics.

HOW THE SEED OF DODDER MAY BE DETECTED.

Detection of the presence in commercial seed of dodder, irrespective of its kind, demands first consideration, because its presence justifies refusal to purchase such seed. A magnifying glass is necessary, as it would enable one to readily distinguish any kind of dodder seed from clover, lucerne, or flax seed. Dodder seeds are, as a rule, about the same size as red clover seeds, including the smallest and largest seeds. The surface is finely roughened and dull, and the general form varies from nearly spherical to strongly flattened and oval or nearly circular. The colour is grey, yellowish brown or reddish brown, depending largely on the kind. In contrast, clover and alfalfa seeds are smooth, often with a slight luster. Their triangular, oval or kidney form aids in distinguishing them from the seeds of dodder.

* * * *

The use of a sieve with which a considerable quantity of the seed, if in bulk, or all of a sample can be sifted affords the most practical means of detecting the presence of dodder. The sieve should be such that only the smallest or medium sized crop seeds will pass its mesh. The smaller dodder seeds, such as those of flax dodder, clover dodder, and small-seeded lucerne dodder, will readily be concentrated to smaller bulk by this means. The large-seeded kinds will be represented by their small seeds. Care should be taken to sift only a small quantity of seed at a time.

As a final resort in case of doubt, examination of the structure of the dodder seed shows it to contain a slender thread-like embryo coiled within the endosperm, which becomes gelatinous when wet. If a few dodder seeds are boiled in water for a time the embryo emerges from the ruptured seed coat, often becoming separated from it as a slender coiled object.—("U.S. Department of Agriculture, Farmers' Bulletin No. 306.")

EXTRACTS FROM EXCHANGES.

ADVANTAGES OF GOAT-KEEPING.

(The Journal of the Board of Agriculture.)

Although goats have long been kept in this country, it is only of recent years that "the poor man's cow" has begun to receive public recognition in Great Britain. Goats are now exhibited in some numbers at the Dairy Show and at many of the County Agricultural Shows. By the introduction of foreign blood not only the size and comeliness but the milking powers of the nannies have been increased. People who have never met with any goats other than the chance-bred aboriginals of the United Kingdom have no notion of the appearance or value of a good goat, but in Switzerland, France, Germany and Scandinavia, the value of the goat as a milk producer has been developed to a remarkable degree.

An advantage offered by the goat as a milk-producer lies in her small size and accommodating ways in the matter of food. Another point in the goat's favour is the quality of her milk, sometimes nearly twice as rich as cow's milk. A third argument for goat's milk is that the hardy animal which yields it, though not immune to tuberculosis, is seldom attacked by this disease. Goat's milk is particularly serviceable in the case of infants, for whom doctors are increasingly recommending it. The belief that goat's milk has "a taste" is founded on acquaintance with milk which has been kept in dirty vessels, or is old, or is the product of a goat which has had access to ivy, garlic, or some other strong-scented food. Unwatered goat's milk tastes richer and sweeter than cow's, and unprejudiced people who have the choice generally prefer it.

* * * *

Yield of Milk.—The maximum yield is not usually obtained at the first kidding. Many common goats do not give two quarts (4 pints) of milk daily, but unless food can be obtained cheaply no goat should be kept which gives less than this quantity at kidding. Such an animal costs as much to keep as a better one. "Two quarts at least, dropping gradually after a few months," is the formula for the goat-buyer who has much food to buy.

Price of Goats.—Goats yielding less than two quarts at kidding and occasionally goats giving more can be picked up at low prices. Among the goats brought over from Ireland animals may sometimes be found which are excellent value. Ordinarily, the price of goats is about £1 a quart up to two quarts. Above that yield the rate rises. No owner of a gallon (10 lbs.) goat would sell it for less than £10. A five-pint goat would be cheap at £2 10s., and is seldom obtainable at that price. Owing to the increasing interest in goat-keeping, good goats are advertised for sale, and prices have risen; but in many rural districts serviceable goats can be got for sums within the small holder's reach. The Rev. E. P. Boys-Smith observes: "A goat which will give 600 lb. of milk, say 2 lb. daily, during ten months, does fairly well in the way of profit. Of course she will give much more daily during her second, third, and fourth months than in her eighth, ninth and tenth; probably she will give five times as much. But

it is not too much to look for 800 lb. instead of 600 lb., and exceptional goats will range up to 1,200 lb. or more, though the upper limit is very exceptional. Assuming a goat of no particular breeding, which yields 700 lb., its worth may be put at about £3 to £6, according as it is to be sold just after kidding, or just before going dry. But in point of fact one may meet with such a goat at any price between 15s. and £15."

Breeds.—A higher price is asked for a pure-bred goat than for an animal of uncertain ancestry. The foreign blood introduced into England is chiefly Swiss and Nubian. The advantage derived from the blood of foreign goats is two-fold. In the first place, particularly in the case of Swiss animals, they have been bred for generations for milking capacity. The other advantage is that they usually breed more freely than our native animals. It is the nature of the goat to breed once a year, in the spring. With foreign blood, or an infusion of foreign blood, it is possible to breed at other times than the spring. An authority has expressed the opinion that "any one could have milk all the year round with three Anglo-Nubians."

Many of the best goats in England are called Anglo-Nubian. The most generally esteemed among the Swiss varieties is the Toggenburg. There is now a large number of Anglo-Toggenburgs, Anglo-Toggenburg-Nubians, and Anglo-Toggenburg-Anglo-Nubians in the United Kingdom. Alpine and Saanen are two commended varieties. It is doubtful if there is any "best breed." As in the case of the development of laying powers in hens, milking powers may be increased in most breeds by systematic breeding from good milkers, mated to the progeny of good milkers, with due attention to stamina and the avoidance of in-breeding.

PERSIMMON.

(*The Field.*)

The death of the King's great horse Persimmon is a severe loss to the turf, from a stud point of view, as, with only fifteen years on his shoulders, he must have been of incalculable benefit to racing for well on to a dozen years more. The accident which happened to the horse quite recently was apparently of greater moment than the outside world imagined, though the fact that his engagements were cancelled, or transferred to his equally famous brother, Florizel II., following the occurrence, may go far to indicate that recovery was problematical, if not hopeless. Persimmon was foaled in 1893, two years after Florizel II., and four years prior to Diamond Jubilee, the latter of whom was expatriated to the Argentine two months ago for 30,000 guineas. Persimmon's racing career was on a par with what was to follow as a sire. When a two-year-old he began by winning the Coventry Stakes at Ascot, whilst at Goodwood he confirmed the Ascot form in the Richmond Stakes. Later on, though, the Royal colours on Persimmon were relegated to third place in the Middle Park Plate, which was won by St. Frusquin, followed home by Omladina. In the following season it was confidently hoped that Persimmon would see the post for the Two Thousand Guineas, but training difficulties stood in the way, and the wisdom of reserving him for the Derby was amply borne out, as the

stout son of St. Simon and Perdito II. won the King his first Blue Riband of the Turf. Amongst the field was St. Frusquin, who was a 13 to 8 favourite, whilst 5 to 1 was obtainable about the eventual winner. The finish of the race was, in point of fact, a match between the two, but, after a great struggle, Watts (on Persimmon) got home by a neck from the Guineas' winner. True it was that T. Loates, on the favourite, snapped a stirrup leather within a stride or two of the chair, but the jockey was not chary in agreeing that the incident made no difference. In other words the best horse won. But as interesting, perhaps, as the immediate result of the race was the scene of enthusiasm that followed when the numbers went up. In all probability there has never been such a universal display of exuberant excitement on a racecourse; indeed, the welkin rang when the future Sovereign of these realms led his first Derby winner to the weighing-room.

* * * *

Persimmon and St. Frusquin met again in July at Newmarket, when the latter turned the tables on the King's horse in the valuable Princess of Wales's Stakes by half a length. At Doncaster, St. Frusquin was an absentee for the St. Leger, and accordingly Persimmon's victory was the occasion of a second edition of the extraordinary Derby plaudits. That same season Persimmon, backed against the field, carried off the Jockey Club Stakes at the First October Meeting, which was the closing event of his second season. The year following Persimmon won the Ascot Gold Cup in a canter, and his last apearance on the turf, the same season, was in the Eclipse Stakes, in the field for which there was nothing worthy of his opposition. In fact, the triumph was a most fitting climax to a short and brilliant career on the racecourse, the total of his stakes won almost reaching £35,000. At the stud, Persimmon was a complete success, the very first to bring sire and produce fame being Sceptre. The following table will show Persimmon's record as a sire at the close of last season :—

Year.	Races won.	Amount won.
1901	2	£2,455
1902	16	36,863
1903	25	24,472
1904	21	10,308
1905	25	16,443
1906	31	21,737
1907	26	12,815
		£125,093

TYPICAL MERINO WOOL AND THE REVERSE.

(Australasian Wool-Classing.)

The question is often asked, "What is a typical wool?" and various answers are given, some contending that "Quality," *i.e.* fineness, is the most important point; others make "Density" the main consideration, while "Character," "Elasticity," "Length and Strength of Staple," "Colour," etc., are also advanced as important qualifications. However, before a correct estimate of what a typical wool really is can be reached, the standard from which such wool is judged must be stated.

For example, a typical wool from a stud-breeder's standpoint should be a wool grown on a sheep, the progeny of which will produce wool of the most profitable character. In order to do this the wool in question must be of the purest, having the "character" well and evenly defined. The quality of such wool will depend largely on the locality and conditions under which it is grown. The same thing applies to its length of staple.

Thus, moderately *fine* stud wool need not be of such a great length as the *robust* wool, but in both cases they should be as *dense* as possible, without sacrificing more length or robustness than is needed for the purpose for which the sheep on which such wool is grown are kept. The wool should also be sound, soft, elastic, bright, with as little wasty tip as possible. A good tip acts as a preservative, and is essential.

On the other hand, from a flock-master's point of view, as has been already hinted, a typical wool is a wool which will yield the best possible results to the grower. Hence it should be *dense* and of that quality and length of staple suitable to the locality and conditions under which it is grown.

It should be broad-stapled and sound from root to tip, without any excess of yolk. It should be elastic, soft, and kindly to handle, bright, and of good "character," and exactly suited to the requirements of manufacturers who deal in this class of wool.

* * * *

Faulty Wool.

Under this heading many types could be named, but the following, being some of the more prominent, will be sufficient to show that there are many kinds of wool which should be avoided as far as possible:—

Tender Wool.—Weak in staple, with a break in the fibre caused by starvation, disease, etc., while the keeping of the wrong type of sheep in a given locality has much to do with this result.

Dingy.—Lacking brightness.

Discoloured.—Will not scour a pure white, frequently caused by an excess of dead yolk.

Mushy.—Perished, lifeless, commonly due to the hard times undergone by the sheep: kept in certain localities where the sun evaporates the yolk from the fibre.

Kempy.—Small, straight hairs, white or black, generally caused by impurity of breed.

Moity.—Containing twigs, seeds, etc., over all the fleece.

Burry.—Containing a lot of burrs.

Fribby.—Applied to fleece wool where locky pieces or second cuts get intermixed with the fleece wool during shearing.

Stained.—A greeny brownish hue caused by urine.

Noily.—Wool which causes more than ordinary waste in the process of the manufacture of worsted goods.

Loose and Open.—Generally due to old age or ewes, with lambs, going off; when the staples do not cling together.

Stumpy.—A short staple with a broad tip, generally from an old sheep.

Cotted and Matted.—Wool, the fibres of which are matted or felted together. More common in deep-grown wools: caused by ill-health, starvation, etc.—(Geo. Jeffrey.)

DIARY FOR THE GARDEN.

By Alex. Stirrat, Cert. R.H.S. (Lond.), Superintendent of Parks, Johannesburg.

August.

The work of the winter months should now be well in hand and everything in readiness for the more important operations to be undertaken at this time of the year.

Almost every kind of vegetable may be grown at this period of the year, but some sorts need more space and a deeper covering of soil than others. In any case crowding should be avoided, and an endeavour made to prevent the ground from lying idle by having all crops coming on in rotation, and double cropping always, as for example, newly planted strawberries may have lettuce, radishes, or turnips for drawing young, and any similar light crops which are off in a few weeks, planted between the rows. The same may be done between most rows of the Brassica tribe.

Where members of the Brassica family are sown, such varieties as cabbage, cauliflower, etc., should be sown in beds and transplanted when large enough, and during a suitable period, if possible when the soil is nice and moist and the weather dull. Kidney beans may be sown in rows 18 to 24 inches apart. You may also sow spinach, celery, parsnips, beetroot, turnips, etc.

In the flower garden considerable activity must take place during this month if success is to result. Frost may be experienced during any period of this month, and where any seedlings of a tender nature are being grown, some covering must be held in readiness to throw over the young plants during threatening weather.

Cuttings may be taken of chrysanthemums; only those sorts really worthy of cultivation should be inserted. I should like to be able to chronicle the varieties which have proved most successful here, but space prevents the enumerating of them.

All dahlia tubers should now be seen to, and if it is the intention to propagate by cuttings, the old roots should be placed in boxes to start them into growth. When the cuttings are about 2½ to 3 inches in height they may be cut from the parent root, and in doing so it is always wise to have a portion of the old root or tuber attached to the cutting. This ensures the cutting taking root more easily. Place the cuttings in some good, sharp sand and leaf mould, setting them in some gentle bottom heat, and see that the strong rays of the sun are prevented from scorching the young cuttings. Green fly may prove troublesome, but if a solution of soap and water be used with care, these pests may be kept under.

SEPTEMBER.

If not already done, vegetable seeds must now be sown. All kinds of vegetables may be sown during this and the following month, planting out as directed in the preceding notes for August.

In the flower gardens probably greater attention is required than is the case with the culture of culinary plants. Seeds of all annuals may be sown, such as celosia, balsams, anterrhinums, lobelia, begonia, gloxinia, carnation, zinnias, etc.

All mixed flower borders should now be thoroughly manured and trenched, if this has not already been done ; any superfluous plants which proved unsuccessful the previous season should be removed so that the ground may be utilised with better stuff this year.

If the weather is extremely dry, attention must be directed to the watering of such plants as roses, newly-planted trees and shrubs, otherwise serious loss may accrue in respect to plants which are showing flower and those not yet having made ample root growth.

The conservatory should now be thoroughly supervised, the plants repotted, and all the wood-work of the stages, benches and roof scrubbed with a strong insecticide, such as paraffin, soap, etc., thus killing the insect pests which linger in the house during the winter months and now become active, if not arrested promptly. When repotting ferns, see that all loose soil is removed from the crown of the roots. I have repeatedly found slugs to harbour there, and to cause incessant trouble when the young shoots are beginning to develop. In potting, see that the drainage receives attention first of all, otherwise disaster must inevitably follow. The soil should be as open and free as possible, using a compost of good fibrous loam, or peat, leaf mould and sharp river sand.

In cases where it is found difficult to obtain good fibrous loam, I would suggest that the "top-spit" be obtained from any portion of the veld having a good layer of fibrous grass roots. This should be cut to a thickness of, say, three inches, and stacked in a corner of the garden—grassy side downwards—with a layer of good cow manure intervening. This will form an excellent potting mixture in about six months' time.

Primulas and cinneraria will now be almost finished, and the cultivation of such indoor plants as gloxinia, begonia, coleus, etc., will require attention. See that the young plants are repotted immediately they become pot-bound, especially during the early stages of their growth. Plenty of air, judicious watering, and the prevention of insect pests are the chief points to be considered in order to be successful.

OCTOBER.

The cultivation of vegetables should not prove a difficult undertaking at this time of the year. Cauliflowers may be helped with a liberal supply of liquid manure. Tomatoes, vegetable marrows, etc., may be planted out during this month. Lettuce, endive, and salads sown for rotatory use. Keep the land well worked between the rows, eradicating all weeds, as it often happens that by attention to such little details the most successful crops are obtained.

The bedding out of flowering plants may now be pushed ahead. Roses should receive an occasional inspection. Spray as previously instructed for green fly; such plants are liable to be attacked by grubs, which eat the centres out of the young growths. Look out for suckers growing from their stocks, and have them removed forthwith. Hollyhocks which were planted in the latter portion of the previous summer will now be showing their flower spikes, and, being exuberant growing, will benefit considerably by frequent applications of liquid manure or a top-dressing of good decayed stable manure around the base of the plants. Then water frequently.

Carnations will now be showing their flower stems, and should be securely staked. Keep the beds clean, and when showing signs of drying give a liberal supply of water. In the Transvaal one of the most troublesome insects affecting the carnations is the green fly, especially during the dry weather at this time of the year. Spraying or tobacco dusting will exterminate them.

Wire-worms in the soil are also a troublesome nuisance attacking the roots, but if these should appear, carrots placed in the soil affords an excellent bait for them, and if examined occasionally the worms may be easily destroyed.

CORRESPONDENCE.

This column will be devoted to correspondence, and an endeavour made to reply to all inquiries upon agricultural topics, or concerning any of the articles published from time to time in the "Journal."

Correspondents will kindly write on one side of the paper only. No manuscript will be returned.

All letters must be addressed to the Editor of the "Agricultural Journal," Department of Agriculture, Pretoria.

BROOM CORN.

To the Government Botanist.

Sir,—A demand has sprung up in this country for broom fibre. This fibre grows well in many parts of the Transvaal. I have seen some good samples grown at the Botanical Experiment Station, Pretoria, and I am surprised that your farmers are not growing it more extensively, more especially as there is now a good market for it. It seems to me that if it were made known through the medium of your *Agricultural Journal* that this is a payable crop—an easy crop with a ready market—your people would soon take it up. It can be grown on any soil that is suitable for mealies or Kaffir corn, and I am prepared to buy 200 tons at a price that will pay the farmer better than mealies. As to the price, much will depend on the quality of the fibre, and that naturally depends largely on the amount of intelligence put into the growing of it.

To make good fibre, it should be given plenty of room; planted in rows 3 ft. apart, with the stalks 6 to 9 inches apart in the rows; cultivated about three times during growth, and kept free from weeds and grasses. The more cultivation the better the crop and the better the fibre, hence a better price.

With a seeder, 4 lbs. of seed is ample per acre. One thing absolutely necessary is good seed from a reliable seedsman. This can be had for about 6d. per lb. in bulk; probably your local seedsmen would want about 1s. per lb. What other crop can a man put in for 4s. per acre for seed? Best varieties for this market are Californian golden and Japanese dwarf evergreen. I have sent you up a sample of fibre such as I require, and should at all times be glad to give further information to growers.

Yours, etc.,

E. INGLE.

Warwick Street, Claremont,
Cape Colony.

EARLY MATURING SORTS OF MAIZE.

Mr. J. Rabie, of Belfast, writes as follows:—"We have had heavy losses with the early frost; nearly two-thirds of our mealie crop has been destroyed. Have you discovered a mealie which is earlier than the 'Hickory King,' and as heavy a yielder."

Answer.—Of the white dent varieties of maize, we have found "Iowa Silver Mine" and "Champion White Pearl" to be among the best for the high veld. They yield well, and are earlier in maturity than "Hickory King."

Of the yellow dents "Star Leaming" and "Chester County Mammoth" are excellent sorts. Seed of these can be obtained from the Government Experiment Farm, Potchefstroom.

J. BURTT-DAVY,
Government Botanist.

DRY LAND LUCERNE.

To the Government Botanist.

Sir,—I have much pleasure reporting the results of my experiment in sowing dry land lucerne. You will be pleased to hear that my venture has been most successful. During the early part of spring I ploughed and prepared a piece of low-lying land of a vlei nature, in size about 120 yards long and 40 yards wide. Having worked the ground into a fine state of tilth with a Planet Junior cultivator, I drew shallow furrows two feet apart, regulating the distance with a beam strapped across the cultivator, with a hook two feet each way from the centre, using a piece of trek chain as a marker, and waited until rain fell. During November we had a fair rainfall, and the ground became well saturated with moisture. I then sowed the lucerne seed (in the furrows) and harrowed the whole patch with a tooth harrow. Within four days the plants came up, and continued to make a vigorous growth. Nothing more was done until the roots were well established and the plants reached a height of about six inches; with the growth of the lucerne the weeds grew profusely, particularly between the rows. I then stirred up the ground with the cultivator between the rows until all weeds were covered under, and had the rows weeded by a native. After this treatment the growth of the lucerne was amazing, and early in December I had my first cutting.

After cutting, to keep the soil loose I treated the patch with a good sprinkling of stable manure between the rows, working the manure well in. with the cultivator, and the result has been most satisfactory. Up to the present I have had three cuttings, and I feel assured that if rain had fallen last April, instead of the cold weather, a fourth cutting would have been reaped before the crop became dormant.

Next season with the first fall of rain I intend sowing on a much larger scale, and I would advise intending lucerne growers on dry land not to broadcast, *but to sow in rows*, and further not to weed out until the roots of the plants are well established—the weeds protecting the tender lucerne plants from the hot rays of the sun. All attempts at broadcasting on dry land by my neighbours have ended in failure, and none desire to try again.

I may mention that I sowed my seed by means of a brandy bottle, inserting a piece of glass tubing through the cork, and you would be surprised at both the result and speed attained. The seed can be sprinkled in the furrows to any required thickness.

Yours, etc.,

W. R. Slatter.

Kalkfontein, Marico District.

APPLICATION FOR BRAND.

To the Registrar of Brands.

Sir,—We herewith beg to make application for the initials GB to be our registered cattle brand, and shall be pleased if you will kindly let us have those initials, and if the same are already in use to be given any other two-letter brand not yet in use.

Yours, etc.,

Colonial Fresh Meat Supply Co.

Johannesburg.

Answer.—With reference to your application for the registration of a brand consisting of the letters GB, I beg to inform you that the Brands Ordinance provides for a definite system of brands. Each brand consists of three characters, and forms part of the system. This has been done in order to avoid the alteration of a brand by adding to it one or more characters so as to make it represent the brand of another owner. It would be impractical to register the initials of every stock owner, for there are such a large number of people with identical initial letters. To have a neat and known brand we cannot, however, depart from the alphabet. The alphabet consisting of only twenty-six letters renders this impossible, so we are compelled to add something to the letters selected from the alphabet that will increase the number of combinations. Now, if one owner selects JG we add to it a numeral and make the brand JG1. When another owner applies for the same two letters we give him JG2, etc. The first of the two letters in a brand indicates the magisterial district. For instance, all the brands in the Potchefstroom district commence with the letter P, *e.g.*, PA1, PA2, etc. In Pretoria every brand commences with A, thus, AA1, AA2, etc. This has been done to simplify and reduce the cost of administration and to facilitate detection when an animal strays from one district into another.

Enclosed please find an application form partly filled up, which, when completed, may be handed to the Assistant Resident Magistrate (Civil Division), Johannesburg, together with the registration fee of 5s. I should advise you to avoid the use of such a complicated letter as B in your brand. G makes a very plain brand, and I think JG1 or J1G imprints a very neat brand, the characters being plain and open.

Branding irons may be had from this office at 12s. 6d. each.

J. J. Pienaar,
Registrar of Brands.

INFORMATION *RE* BRANDING.

To the Registrar of Brands.

Sir,—I should like to draw your attention to a few things, and also to ask your advice. I am very much in favour of the branding system, but I have found that the letters are so made that when branding they are apt to blur, making instead of plain letters one big raw sore. Another thing: When the branding iron is heated some legs of the letters are so soft that as soon as they are pressed they become bent, when it is impossible to make a decent plain brand. The result is that you either have a crooked brand or one letter goes in deeper than the other, which causes a raw sore. If I knew that I could make my own brand here I would quite willingly pay for an iron, together with the registration fee, but I don't suppose that would be allowed. Still another point: May I select my own number and the placing of it, viz., supposing my initials were either C or T I should like to have it placed P1C or P1T, instead of, say, P3C or PC3, as I think the first would look neater.

Yours, etc.,

C. J. Theunissen.

Lapfontein, Klerksdorp.

Answer.—I regret to learn that you are not pleased with the kind of branding iron supplied by this office. Complaints of this kind are very few, whereas a good many letters reach me every month in which farmers speak highly of the irons supplied from here. Blotchy brands are seldom due to the branding iron. Such complicated letters as B and R, of course, are difficult, but where ordinary care is exercised few bad results will occur. The imprinting of a brand certainly requires a considerable amount of skill. Some branders, although they have had experience in branding, are still lacking in this art. During the last six months 84,000 animals have been branded under my supervision with branding irons made by the same firm, and only about 3 per cent. of the brands imprinted became undecipherable. This is a reasonable percentage. With one branding iron over seven thousand head of cattle were branded, when it was as good as new.

* * * *

The size of a branding iron depends upon the shape of the characters employed. For instance, with a branding iron composed of such plain letters as VT1 one could almost under any circumstances imprint a satisfactory brand, even if it be made as small as 1½ inches in height. But when we come to the handling of a BR8 branding iron, no matter how large the characters are made, an experienced brander is required.

The most important features in the operation, however, are time and heat. I am inclined to think that the branding irons you complain of were heated in a forge fire, which in practice has been found to be most dangerous, for a forge usually heats one letter more than another, and often heats one part of a letter more than any of its other parts. Thus before the cold letters or the colder parts of a certain letter can make a permanent impression on the hide the thoroughly heated parts burn almost through the skin. I would always recommend a furnace for heating purposes. An empty 10 gallon coal-tar drum makes a very useful furnace. In a furnace the heat is uniform, therefore all the characters in the iron obtain an even

heat. Failing such a furnace I would advise a cow-dung fire. Cover the iron well. The iron, before it is taken from the fire, should be red hot, say about 900° C., and if immediately applied about two seconds will suffice to imprint a permanent and satisfactory brand. But if the iron is insufficiently hot, and instead of two seconds some six or seven seconds are taken to imprint the brand, the inner portions of the closed characters are burned, and within six weeks the brand becomes a blotch.

* * *

Owners of registered brands are at liberty to have their brands made locally as long as they observe the prescribed patterns. The reason why branding irons are made here is to assist owners. I do not suppose a branding iron, consisting of three characters, could be made in Klerksdorp at 12s. 6d. In regard to the selection of a brand I wish to state that any applicant is at liberty to select any of the combinations standing vacant in the books of the Resident Magistrate of the district in which his holding is situated. You are quite correct in saying that the numeral 1 looks much neater than the 3. The next best is 7. The brand PT1 is still unallotted, and I should advise you to register it as early as possible. P1T, PC1, and P1C are registered.

J. J. Pienaar,
Registrar of Brands.

PRESERVING BUTTER.

Messrs. Fothergill Bros., of Good Hope Farm, Middelburg, ask for a simple method of preserving a small quantity of butter.

First Method.

Answer.—For preserving a *small* quantity of butter, the following process will answer :—

Heat the cream to 80 degrees Centigrade (176 degrees Fahrenheit) and cool rapidly to under 10 degrees Centigrade. Work the butter intermittently, cooling between the workings till it is very dry. Work plenty of salt into the butter (5 per cent. after working). Keep it in an earthenware pot well glazed on the inside. Pour strong brine into the pot till the butter is submerged. Cover with parchment paper. Keep cool and dark.

Second Method.

Melt the butter. Carefully pour off the clear fat, let it harden again and store it. When required again, gently heat the fat till it melts, add 15 per cent. of pure skim milk, shake vigorously, and pour out suddenly into iced water. The second method makes the fat last longer, but, in preserving, butter *always* deteriorates more or less, however carefully it may be stored. I trust you will find these recipes useful. The first is the more common.

Robert Pape,
Superintendent of Dairying.

BUTTER-MAKING *VERSUS* CHEESE-MAKING.

A correspondent writes to ask whether butter or cheese-making is more profitable in the Transvaal.

Answer.—Here is a calculation for the *average* Transvaal milk: 100 lbs. of milk will yield 4 lbs. butter, or 100 lbs. milk will yield 10-11 lbs. cheese. Let us assume that the butter will fetch top retail prices, this would be 1s. 9d. per lb.; then 100 lbs. milk would sell at four times 1s. 9d.=7s., and leave a residue of separator milk (about 90 per cent.)—which, untreated, is but an indifferent food for cattle—and about 10 per cent. butter milk, which is a good food for young cattle.

Top price for cheese would be 1s. 3d. or 1s. 6d. per lb.; but suppose we only get 1s., then the calculation is: 10 or 11 times 1s.=10s. or 11s. for the cheese, with a residue of about 80 per cent. of whey, which, untreated, is a better food for young cattle than separator milk. Leaving the residue out of the calculation, 100 lbs. milk will yield in

Butter (top price), 7s.
In cheese, 10s. to 16s., roughly speaking twice as much.

Of course in cheese the running capital is locked up during the five or six weeks that sweet milk cheese takes to mature, whereas butter can be sold the day after milking. Further, the butter market is more or less glutted, whereas there is a wide field for cheese. Good cheese can be made in the Transvaal. As a proof of this, I may quote a certain sweet milk Gouda cheese which gained a first prize at the Heidelberg Agricultural Show. Now this cheese was lacking in some points, but the taste was all right, and that is the chief difficulty. Moreover, let us suppose that the cream can be sold at 1s. 3d. for butter-fat, and the whole milk for 5d. or 6d. per gallon. Which would pay better? Now, 100 lbs. of milk contains, roughly, 3½ lbs. of butter-fat, which at 1s. 3d.=4s. 10½d. How much does this mean per gallon? 100 lbs. milk=10 gallons, and 1 gallon sells at 5d. to 6d.

When farmers ask me what nett returns they may expect from a cheese-making dairy (run by themselves), I give them the estimate of 9d. per gallon of milk, provided good cheese is made. Then I reckon they realise 1s. per gallon of milk at least, and allow 3d. per gallon for working expenses, which is more than ample.

ROBERT PAPE,
Superintendent of Dairying.

SECRETION OF MILK.

To the Editor of the *Agricultural Journal.*

Sir,—I was much interested to read in the April number of the *Agricultural Journal* some interesting notes from *The Field* upon methods of milking. The writer introduces his subject by saying that "the success of milking depended upon the *attitude of the cow.*" This savours of the generally experienced and fully believed idea out here that a cow can hold up her milk! Now, is this really possible? Is it not a fact

Plate 92. **Lincoln Red Shorthorn Bull. "Alford King." D.O.A. 3P.**

Winner of Champion Prize for best Bull in yard at the Witwatersrand Agricultural Show, 1908. Exhibited by Transvaal Department of Agriculture.

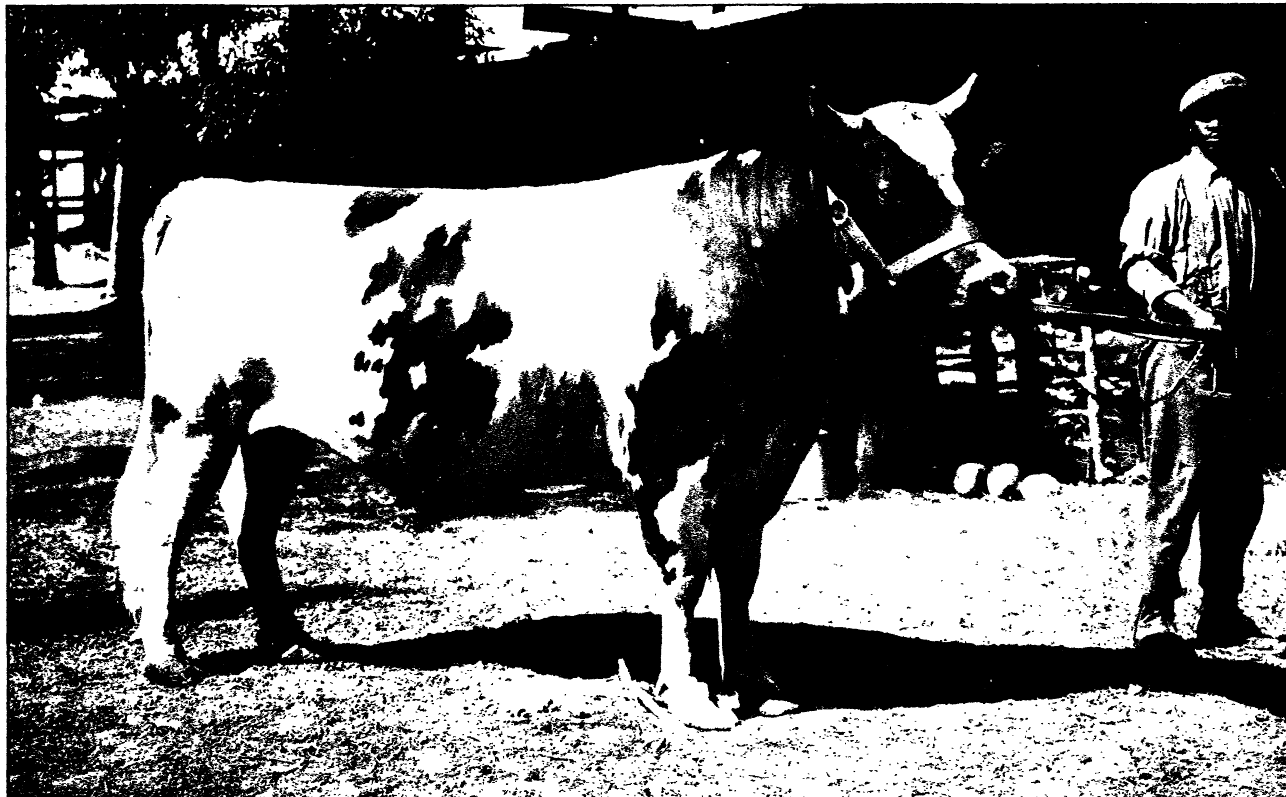


Plate 93. **Ayrshire Bull, "Nethercraig Merry Monarch." D.O.A. 13P.**

Winner of First Prizes at the Witwatersrand Agricultural Shows, 1907 and 1908; and Sire of the best three Ayrshire Heifers. Exhibited by the Transvaal Department of Agriculture.

Plate 94.

Africander Bull.

Winner of First Prize, Witwatersrand Agricultural Show, 1908.

Exhibited by Mr. H. Jacklin, Klip River.

that there are no voluntary muscular fibres in any part of the cow's udder which would enable her to exercise the faintest control over her milk ?

I cannot help thinking that the "willingness," or the reverse, of a cow "to part with her milk" lies, not in any voluntary power to part with it or to withhold it, but in the "nervousness"—as a medical man would put it, viz., in the nervous temperament rather than the sanguine—which requires quiet, soothing methods to relax the milk-ducts and the blood vessels, and so enable a steady flow of milk towards the nipple or teat.

Again, the warm or hot mouth of a calf sucking would readily produce the kind of relaxation to be desired in a "nervous" cow which the cool, or even cold, hand of a hurried milker would fail to produce altogether, and in illustration of this I may quote an instance :—Having a "nervous" cow and an unskilled, though very willing, native milker, I introduced a system of hot water which the milker made his hands quite hot in, and then proceeded to splash over the udder and teats of the cow, with the result that the cow in a few days gave *double* the quantity of milk I had been accustomed to, to the milker's very great astonishment, and I may say to my own surprise also ! No alteration was made in the diet of the cow, and nothing else was responsible for this increase but the soothing and relaxing influence of the hot water. I have, through every winter, instituted this method with this particular cow, and with equal success. It was founded upon the fact well known to medical men that nervousness causes a more or less contraction of vessels, local or otherwise, shown in the paling and temporary bloodlessness of the surface—the result of mental inhibition. I should greatly appreciate some opinion from a veterinary expert upon this subject.

Yours, etc.,

Middelburg. H. A. SPENCER.

* * * *

Answer.—With regard to the point raised, the position appears to be this :—When an animal is milked, what actually happens is that the milk already secreted is first removed. This is purely a mechanical process, over which the animal exercises no voluntary control. Then the act of removing the milk already formed acts as a stimulus to the gland cells concerned in its formation, and more milk is formed, which is removed in turn. This goes on till the gland cells are temporarily exhausted, and no longer respond to the stimulus supplied by the act of milking, when the process ceases.

Now, although the animal may not be able to hold back the milk which has already accumulated, the process of secretion is, to a certain extent, under the control of the central nervous system, and if the animal is roughly handled by the milker, or excited in any way, this disturbance of the nervous system may exercise an inhibitory, or checking influence on the continued action of the gland, and the total quantity of milk obtained will be diminished in amount. On the other hand, if the animal is handled gently and skilfully, and any means are adopted

which tend to dilate the blood vessels of the gland—a phenomenon which is favoured by the application of warmth—the amount of milk obtained at a milking will undoubtedly be greater.

C. E. GRAY,
Principal Veterinary Surgeon.

MINE TAILINGS ON THE RAND.

To the Editor of the *Agricultural Journal.*

Sir,—I should like to know whether anything can grow on the dumps of the mines? Does anyone in the Agricultural Department know the composition of the sand of the dumps, or shall I send a specimen to be analysed? If one could plant some grass or shrub of some kind to bind the sand together, it would be an inestimable blessing to the people on the mines.

Yours, etc.,
FLORENCE PHILLIPS.

Arcadia, Johannesburg.

Answer.—I examined some samples of the tailings taken from such heaps some time ago, and the result may be of interest to you. I therefore append an abstract of a report which I wrote in 1905 on behalf of the Municipality of Johannesburg.

* * * *

Four samples were received from Mr. John Dove, then Town Clerk of Johannesburg, in June, 1905, which were described as follows :—

1. From fresh tailings taken from the skip on the way to the dump.
2. From tailings about six months old, taken from just under the surface of the dump.
3. From tailings about twelve months old.
4. From tailings which had been exposed to the weather for at least six years.

All samples were from the Ferreira dump. In No. 1 no appreciable amount of cyanides could be detected (the examination was not made until the sample was a few weeks old), but the presence of sulphides in considerable quantities was clearly evident. I am inclined to think, therefore, that the sterility of the dump is dependent more upon the presence of sulphides than of cyanides. The composition of the tailings is shown by the following figures :—

Moisture	5.47
Loss on ignition	1.10
Silica	90.76
*Iron oxide and alumina	2.35
Lime	0.91
Magnesia	0.21
Potash	0.05
Phosphorus pentoxide	0.03
	100.87

* Most of iron was present as sulphide—probably as pyrites.

The mineral ingredients necessary for plant growth—potash, lime, magnesia, and phosphoric acid—are thus present in sufficient quantities for the requirement of plants, the first-named being perhaps most deficient. But the presence of oxidisable sulphide of iron renders the material sterile even if the absence of nitrogenous matter did not do so.

The sulphide of iron undergoes slow oxidation, being slowly converted by absorption of oxygen into sulphate of iron and free sulphuric acid, which at first is neutralised by the lime present.

Thus at first (No. 1) the tailings are distinctly alkaline in reaction, due to the presence of free lime, after some time (No. 3) they become neutral, while after some years (No. 4) they develop a distinctly acid reaction.

The total sulphur present diminishes as time elapses, owing to the formation of soluble sulphates and their removal by rain.

Determinations of the total sulphur and soluble (in water) sulphur gave the following:—

	Fresh.	6 Months.	12 Months.	6 Years.	
Total sulphur	1.21	1.21	1.10	0.24	per cent.
Soluble Sulphur.. ..	0.012	0.010	0.011	0.029	..

It would thus appear that during the first year the oxidation and removal of the sulphur was slow, but that afterwards it proceeded more rapidly, but that even after six years there still remained some unoxidised sulphur. Of course these deductions are based on the assumption that the material when deposited was of similar composition during the whole period.

* * * *

In order to render the tailings more capable of supporting plant life, it seems to me to be necessary—

1. To destroy the oxidisable sulphides—pyrites, etc.
2. To increase their porosity and friability.
3. To add the necessary nitrogenous organic matter.
4. To neutralise the acidity which developes upon the oxidation of the pyrites.

No. 1 could only be done on the large scale by the air, and for this to occur No. 2 would have to be effected. No. 2 could probably be accomplished by mixing the surface of the dump with granular "clinker" from engine furnaces, rejecting the fine ashes and the very coarse clinker. This admixture would render the surface porous, and would favour oxidation by facilitating the access of oxygen. The oxidation would be favoured by periodically watering the surface.

No. 3 would be best done by adding stable manure or similar material *after* Nos. 1 and 2 had been in operation for some time. If added too early, the organic matter being itself oxidisable would tend to prevent the oxidation of the pyrites.

No. 4 could be best effected by the addition of powdered lime added simultaneously with the stable manure.

As to quantities it is difficult to advise; probably 10 or 12 tons of clinker per acre would suffice. The granular clinker should be spread on the surface and harrowed or raked in, and an occasional harrowing, say once a month, would probably be helpful, especially after rain or watering.

The stable manure should be applied at the rate of 20 or 25 tons per acre, and powdered lime to the amount of, say, 2 tons per acre well harrowed in, followed after a month or six weeks by the grass or other seeds.

* * * *

I fear the above method would be expensive, but I cannot suggest any cheaper plan likely to be successful. Of course another method, but I fear almost too laborious and expensive, would be to cover the dump with a layer of soil to a depth of six or eight inches, and plant the seeds in that.

Our Agrostologist, Mr. Burtt-Davy, suggests Bermuda grass "Oprecht kweek gras" (*Cynodon Dactylon*) as a suitable grass for the purpose of trial.

Some relief from the annoyance of dust blowing from the dump heaps might possibly be derived from the use of shelter belts of trees planted round the heaps, but of course a considerable time would be required for the trees to grow sufficiently high to be effective.

Our Conservator of Forests, Mr. Legat, advises *Eucalyptus viminalis* as the most suitable tree, to be planted in belts at least a chain wide around the dumps, the trees to be planted six feet apart, and those nearest the dump to be allowed to be highest, those furthest away lowest, so that the wind would be turned upwards by the belt. I am afraid, however, that the problem is a difficult one, and in any case would entail considerable expense and labour. I regret that I cannot suggest any simpler and less troublesome plan.

HERBERT INGLE,
Chief Chemist.

EDITORIAL NOTES.

Cotton-growing in the United States of America.

ON the cover of this issue there appears a photograph which shows a simple form of cotton gin being operated by two sturdy natives on the premises of the Botanical Experiment Station, Pretoria. And this illustration has a special interest in that it is the small beginning of what will doubtless soon develop into an important and profitable industry for this State. Such, at any rate, has been true of this great industry in the United States of America. For we are told that when, in the year 1784, eight bales of cotton were shipped from the United States to Liverpool, the English Custom-house authorities seized the consignment on the plea that such a large quantity could certainly not have been grown in the New World. And we have sometimes wondered what those worthy port officials would have said if they could have foreseen the startling growth of this industry in little more than a single century. Just on the eve of the Civil War the annual yield of cotton in America was 4,500,000 bales. To-day it stands in round figures at 14,000,000 bales ; and so—one hundred and twenty-six years after the first shipment to the shores of Britain—Mr. Secretary Wilson was able to remark with justifiable pride in the "Year-book of Agriculture" that "in Texas alone the cotton crop is greater than that of British India and nearly three times that of Egypt."

* * * *

In the States of the Empire.

To challenge such magnificent figures may surely seem a trifle daring, nevertheless, we firmly believe that within the next quarter century even this gigantic and ever-growing yield will be surpassed by the still greater production of the States of the British Empire. It is but four years ago that a few patriotic citizens met in the town of Manchester to discuss some means of stimulating the growing of cotton in the various Colonies of the Empire : and their deliberations ultimately led to the formation of "The British Cotton Growing Association," which has since been granted a Royal Charter. A few days ago we received a valuable brochure which has recently been issued by this Association. And in view of the interest which many of our farmers are now taking in the possibility of growing cotton in several districts of the Transvaal and Swaziland we set down a few of the more salient paragraphs from this—the third annual report of the British Cotton Growing Association.

* * * *

The West Indies and West Africa.

ON page 20 of this report we are informed that, however great may be the potentialities of the other portions of the Empire, the largest tracts of land under cotton at the present moment are in India,* and if it were only possible to improve the quality of Indian cotton Lancashire's dependence on the vagaries of the weather in the United States would become a question of the past. Regarding the West Indies, it is stated that the industry has now been established on a permanent basis, and, further, that we can rely upon these islands for a sufficient supply of the best long-stapled cotton to render us in large measure independent of America.

* Last year India produced 4,880,000 bales and Egypt 923,000 bales.—(Editor, *T.A.J.*)

Turning to West Africa, we learn that, although there have been some failures in Sierra Leone, these have been more than outweighed by the success which has been won in other Colonies, and the Council of the Association are now convinced that Lancashire can confidently look to the West Coast of Africa as the great cotton field of the future.

* * * *

Nigeria.

It is instructive to note the progress made by the little province of Lagos, in Southern Nigeria. This Colony, which is roughly the size of the Zoutpansberg, with the District of Marico thrown in, exported in the year 1902 cotton and seed to the value of £200; whilst in 1907 this export trade had risen to £100,000. Speaking of Southern Nigeria, the report states :—

"The great difficulty the Association has to face everywhere is to induce the natives to grow cotton, and in some districts this will require much patience and perseverance. The experience of 1907 has only still more strongly convinced the Council of the soundness of the opinion originally formed, namely, that, speaking generally, throughout the whole world cotton must be more or less a black man's crop, and that therefore the principal energies of the Association must be devoted to establishing its cultivation as a native industry."

Touching Northern Nigeria, it will interest Transvaalers to learn that the new Governor, Sir Percy Girouard, K.C.M.G., has been pushing forward railroad construction in the most energetic manner, and in addition to railway transport Sir Percy has been studying that much-neglected natural highway, the River Niger. He says :—"The Niger will compare most favourably with the Mississippi, and is the cheapest and best outlet for the trade of Northern Nigeria."

Nyasaland and Uganda.

Turning next to Nyasaland—as British Central Africa is now more correctly termed—it is worthy of note that cotton now heads the list of exports, being, according to our latest figures, 1,444 bales of 400 lbs. each.

Northwards—in Uganda—the most notable event during the past year was the visit of the Right Hon. Winston Churchill, M.P., the former Under-Secretary for the Colonies. Mr. Churchill speaks most enthusiastically of the great possibilities of Uganda as a cotton-producing country. This wonderful agricultural region possesses some 25,000 square miles—or, in other words, an area equal to the Zoutpansberg—of suitable cotton land adjacent to the great lake—Victoria Nyanza—with over one million native farmers possessing a fair amount of local agricultural knowledge. Let us figure what this means: 25,000 square miles=12,000,000 acres, at a probable yield of one bale per acre=12,000,000 bales per annum.

Referring to the lack of experts to superintend the growing of cotton in Uganda, the report says :—

"In this connection it should be noted that it is extremely difficult to find agricultural experts with the necessary scientific training and sufficient knowledge of cotton to direct and control the establishment of the industry in a new country. The Council have urged the Government

very strongly to inaugurate agricultural scholarships to enable young men who have had a practical and scientific training in Great Britain to spend two or three years in studying cotton and other tropical products in the West Indies, Ceylon, Egypt, America, or elsewhere."

East Africa and the South.

CROSSING from Entebbe to Kisumu we enter British East Africa, where we remark that Major Leggett, formerly of the Transvaal Burgher Lands Settlement, on behalf of certain capitalists, has co-operated with the British Cotton Growing Association, and that £2,000 per annum will be spent by the Government and the Association on "Experimental and Educational Work," while five ginneries are now in active operation. The cotton grown is mostly of the Egyptian type, and the Council confidently look forward to a large shipment of long-stapled cotton from this portion of the Empire.

Passing southwards the report states :—

"Some excellent small lots of cotton have been produced in various parts of South Africa from the Transvaal down to Cape Colony, and if growing *good samples* was the only criterion one would say that South Africa was an ideal cotton-growing country. . . . . But for some reason or other no planter in South Africa has yet succeeded in producing any quantity of cotton. This is the more disappointing, as with the one exception of the West Indies, South Africa has sent home better samples than any other part of the Empire. Some small lots of cotton recently received from Cape Colony were valued at over 12d. per pound."

* * * *

The Cotton Zones of the Transvaal.

NATURALLY, the question of the Transvaal as a cotton country interests us more particularly. During the past three years the Division of Botany, under Mr. Burtt-Davy, has been actively engaged in collecting pertinent data concerning the cotton zones of our Colony. In short, it may be said that these experiments show that almost the whole of the low veld and many parts of the middle veld are admirably adapted to the culture of cotton, but that the climate of the high veld is mostly unfavourable. Moreover, the normal Transvaal season is specially suited to cotton, since the rainy period—December to April—is, as a general rule, of sufficient duration for the full growth and development of the plant, whilst the crop can be gathered in the dry season, which extends from May until August.

The most suitable areas have been found to be the eastern foothills of the Drakensberg, the Zoutpansberg, Lydenburg, Barberton, and Piet Retief Districts, together with Swaziland. Although the supply of labour in many parts of the Transvaal is more or less limited, yet in the region best suited to cotton cultivation there are numerous natives, more especially in the proximity of the various locations. In the case of the Zoutpansberg, where the best samples have been produced, the cost of transport is excessive, but it is not too much to hope that ere long a railway will connect this cotton zone with the town of Pietersburg.

As is well known, certain varieties of cotton grow wild in the Transvaal, but these are of an inferior quality. Experiments, however, are being made to try and improve some of the best exotic varieties. A large

number of samples of cotton, comprising Native, American Upland, Egyptian, Brazilian, and Sea Island varieties, have been examined by the Imperial Institute in London. The best results were obtained from the improved types of American Upland cotton, excellent specimens of which have been grown in the Zoutpansberg and Waterberg districts, being valued at ½d. to 1½d. per lb. in advance of the best "middling" American cotton.

* * * *

The Future of the Industry.

FINALLY, the question may be put: What prospects does the future hold for the cotton farmer? The reply is that every day new mills are being erected both in Great Britain and America, and the constant call is "more cotton." The reason is not far to seek. Civilisation has spread even to the eternal snows of Ruwenzori*; every christianised native desires a piece of cloth; and the rondavels on the Nile, the Niger, and the Zambesi ask for the "piece goods" of the Lancashire looms. Again, the interior of China is rapidly becoming a huge market for cotton goods, not to mention Russia and Japan.

The well-trained cotton expert will certainly not fail to find employment in the near future, and for the young men of the Transvaal who are both willing and anxious to spend four years of solid training in any good agricultural college, and are then prepared to take up the special study of cotton, an honourable career lies open; not alone in the Transvaal, but also in those several great States which, whether in the north, the south, the east, or the west, together form our vast and priceless heritage in Africa.

* * * *

Codling Moth Inspection.

THE article in this issue on the Codling Moth, by Mr. C. W. Howard, will be read with interest by our fruit growers. It is gratifying to know that all apples, pears, and quinces, which arrive from the Sister Colonies, as well as from oversea, are carefully examined at Johannesburg and Pretoria for the purpose of detecting the presence of Codling Moth. Should one apple, pear, or quince in each hundred show signs of Codling Moth, the whole consignment is destroyed.

The work of inspection in connection with Codling Moth at Johannesburg has been particularly arduous during the past season, principally on account of the fact that it has been carried out in the most thorough manner. Towards the beginning of the year consignments of apples and pears from Cape Colony and Natal were frequently found to be infested to the alarming extent of from twenty to forty per cent., but we are glad to be able to state that during the last six months a marked improvement has been observed.

* * * *

The one-per-cent. infestation may be considered by fruit exporters in the Old Colony and Natal to be rather severe, but as this pest has not, up till now, gained a foothold in the Transvaal, it is most essential in the interests of the fruit-growing industry of our Colony that these restrictions should be rigorously carried out. One hundred and twelve consignments of apples and pears were condemned and destroyed at Johannesburg

*A chain of mountains in Uganda—just north of the Equator—over 16,000 feet high, covered with perpetual snow.—(Editor, *T.A.J.*)

and Pretoria during the past fiscal year. It may be stated, however, that—according to an agreement with the Cape Government—boxes of apples and pears which show an infestation not exceeding fifteen per cent. can be returned to the Cape, at the expense either of the consignor or consignee. Formerly, it was common for consignments of apples and pears arriving at Johannesburg from oversea, which were found to be infested with Codling Moth, to be reconsigned to Lourenco Marques for disposal there; but as the Portuguese Government intend, at an early date, to put into force Plant Import Regulations similar to those of the other South African States, it is safe to infer that such shipments will, in the future, be prohibited from entering the Province of Mozambique. This policy is in line with the new forward agricultural movement which is now actuating the Government of Portuguese East Africa in the development of her rural and industrial resources.

The Government Entomologist of Portuguese East Africa.

IT is, however, with much regret that we observe that the first paper of this issue will be the last from the pen of Mr. C. W. Howard, in his capacity of Government Entomologist to the Transvaal, as he has been offered, and has since accepted, the position of Government Entomologist to Portuguese East Africa.

Mr. Charles Walter Howard was born at Ogdensbury, in Northern New York, and, after pursuing his studies at the High School, won a State Scholarship to the University of Cornell, where he graduated B.A. in 1904, taking special work in Entomological Science. After acting for a year and a half as Assistant to Professor Comstock, of Cornell, Mr. Howard was, on the recommendation of the American Government, appointed to the Transvaal in 1905. Here, he will long be remembered for those sterling qualities of industry, courtesy, and good-fellowship which made him alike popular with the farming population and his colleagues in the Department of Agriculture. While we deplore his loss to the Transvaal, we congratulate our ancient ally on having secured the services of one who, we are confident, is destined to take his place in the very front rank of Economic Entomologists.

* * * *

The Locust Campaign.

DURING the recent campaigns against the brown and the red locusts, it has been found that reports regarding their movements are of the utmost importance, as it is only by the receipt of prompt and accurate data that we are able to make reliable forecasts for the forthcoming season. Such reports are most useful at the present time, as the brown locusts have begun to lay their eggs, and farmers and others who are interested in this work are earnestly requested to aid the Division of Entomology as much as possible.

A large number of tabulated forms for the regular receipt of such reports have already been sent out to all field cornets, who are rendering us most valuable assistance. Arrangements have also been made for receiving telegraphic reports from the police and station masters along the several lines of railway; and from this data weekly reports will be compiled regarding the general movements of locusts in every district of the Transvaal. These reports are then forwarded to the daily papers, in

order that the public may be kept fully informed as to the latest movements of flying locusts.

We have also received requests from many individual farmers to have their names placed upon our list of telegraphic reports. In many instances, by means of a wire, farmers have been warned of the approach of locusts, and their crops saved.

Reporting by Post-cards.

PRINTED post-cards are used to report swarms of the locusts. These post-cards are printed in English and Dutch, and have been widely distributed to the resident magistrates, field cornets, farmers, and police. The ease with which these cards can be filled in should commend itself to every one; and it is hoped that this system will be widely employed. When the cards are received by the Division of Entomology prompt action is taken; and the information marked on a map and indexed for future reference. Although it is expected that the locust campaign will not assume such vast proportions as was the case last year, nevertheless, preparations are being made in order to prevent our farmers from being taken unawares.

The Arsenical Method.

THE method of destruction adopted by the Transvaal is receiving encouraging recognition, not only all over South Africa, but in other parts of the world. It is to the honour of Natal that the discovery of the arsenical method was due, but it has been most widely and successfully used in our own Colony, and has since proved to be the most efficacious and economical method of locust destruction. The Government of Peru, through their Consul-General at New York, has lately been in communication with the Department of Agriculture, whilst several letters have recently come from private persons in New South Wales who are striving to induce their Government to adopt this method. The actual cost of locust destruction work from October, 1907, to April, 1908, was £11,837 13s. 10d., including the cost of material used.

On Ramie Growing.

LATELY, a number of enquiries have been received by the Government Botanist regarding the growing of ramie. The Division of Botany will gladly receive and submit samples of ribbon to competent authorities in England for technical examination and report, but at the same time it must be said that the prospects of profitable ramie growing in the Transvaal are not very bright just at the present moment. This is mainly due to the fact that no proper machinery has been invented for degumming the stems, and unless this can be done on the field, and by the growers themselves, the fibre suffers both in quality and value. In China, which is the main source of supply, this work can be done by the hand owing to the very low cost of labour; but it is unlikely that hand labour could be profitably employed anywhere in South Africa on account of the higher rate of wages.

Ramie Ribbons and Prices.

SAMPLES should be submitted to the Department in the shape of ribbons—that is to say, the stems should be cut green, just when the plant is in full flower, and then macerated lightly and scraped until the fibre is exposed. The strips of fibre—full length of stem—are next rinsed in clean water to get rid of the gummy matter, and are afterwards dried in the shade. Dried stalks can be treated in a similar manner, but are more difficult to deal with. The following extract is taken from a circular letter issued by the Ramie Growing Association in England :—

"To-day the *best cleaned samples of fibre*—not ribbon—are fetching £37, or even more, per ton. No doubt as the production increases the price would tend to decline. At £30 per ton ramie would come into competition with flax, and at £20 with cotton."

The following information is given in the Malay Straits *Agricultural Bulletin*, which comes from a country well known for its cheap labour supply :—

"We are informed that ramie can be grown at an average price of £7 to £8 per ton. Natives in Asiatic countries are satisfied with, and make a profit on, £10 per ton. The best proof that it is a profitable crop we gather from Chinese sources, where, we are informed, it costs about £7 to grow, and where a Chinaman sells his crop for £12 to £14 per ton."

* * * *

Calabash-Pipe Gourds.

READERS of the *Journal* will be interested to learn that the Division of Botany has been experimenting with the cultivation of the calabash-pipe gourd (*Lagenaria vulgaris*), in order to determine whether it can be grown in this Colony. Much difficulty was experienced in getting seed, as the Cape growers appear to object to parting with it. However, a small quantity was finally secured, though rather late in the season, and this was sent to the Botanical Experiment Stations at Pretoria and the Springbok Flats.

The abnormally dry season on the Springbok Flats destroyed all the plants there, but at Pretoria a fair crop was secured, from which some seed has been saved. If sown at the same time as melons and watermelons, and given the same care and protection from early spring frosts, there seems to be no reason why good crops cannot be raised on suitable soils. A Capetown correspondent writes that the best soil, producing the nice yellow tint required, is the "Karroo sand," such as is found near Ladismith, whence the best bowls are obtained.

We understand that there is a large demand for calabash bowls, the supply being far short of the demand. A small quantity of seed is available for distribution to farmers, and applications should be made to the Government Botanist.

* * * *

Black Rot in Apples.

ATTENTION is directed to a notice which has been published in the *Government Gazette*, 26th June, 1908, to the following effect :—

"Importers of fruit are hereby warned that, in view of the fact that large consignments of apples from Cape Colony, affected with the black rot fungus (*Sphæropsis malorum*, Peck.), are arriving in this Colony, it is the intention of the Government to safeguard the interests of local fruit growers by ordering the destruction,

or return to the consignor, of all pomaceous fruits found infected with this fungus to the extent of one per centum and upwards."

An Imperial Meteorological Congress.

It is of interest to learn that the Royal Society of Canada, with the encouragement of the Dominion Government, has convened a Congress in the coming August of all the chief officials in the various Meteorological Departments of the British Empire: and our readers will be glad to know that the Transvaal Government has decided to send the head of its Meteorological Department—Mr. R. T. A. Innes, F.R.S.E.—as their representative, instructing him at the same time to visit the American Weather Bureau at Washington, in order to study the latest methods of weather forecasts for the benefit of the farming community.

Sun-dials.

Sun-dials have very naturally dropped out of use in Europe, where the sun is uncertain, public clocks common, and distances of no account. But in our sunny climate and sparsely populated Colony the value of the sun-dial should be made widely known. We learn that Messrs. Dolland & Company, 35 Ludgate Hill, E.C., London, are prepared to supply porcelain dials adjusted to any desired latitude for use in the Transvaal, at something under 20s. each. With these dials it is not a difficult matter to get correct time to within a minute, which is accurate enough for most farming operations. We hope in a later issue to give such particulars as will enable any handy man to rig up a dial for himself.

Lectures on Agricultural Science.

The cause of agricultural education is being materially assisted by the action of the Council of the Rhodes University College, Grahamstown, which is offering a series of lectures on agricultural science to farmers and their sons. These vacation courses, which we cordially commend to the readers of the *Journal*, will include such subjects as veterinary science and diseases of stock, entomology, farm engineering, agricultural chemistry and geology, the management of ostriches, fruit culture, stock and stock farming, dairying, crops and seeds, agricultural economics, and forestry. The lectures will be held in Grahamstown, beginning on 6th July and ending on 25th July, and will not presume any previous theoretical knowledge of the subjects. They will be of as practical a nature as possible, and students may select all or any of the subjects, according to the time at their disposal. The courses will be followed by practical demonstrations, consisting of examination of specimens, dissections, and microscopic preparations. Visits will be arranged to neighbouring fruit and stock farms and local industries. The fee for all the courses will be £3 3s., £2 2s. for one week, or £1 1s. for any single course. The expenses involved, exclusive of the railway fare, will be the fee of £3 3s., and about £2 per week for board and lodging, amounting to, say, £9 for the complete course.

The National Union.

In our last issue we referred to the formation of the South African Organisation Union, which has for its object the development of South African industries. In May last, a Congress of delegates from the different branches throughout South Africa met at Bloemfontein to draw up a constitution defining the objects and scheme of work, and at that meeting the title was changed to the National Union. Strong committees have been formed at Pretoria and Johannesburg, and work actively commenced. A new feature has been introduced in the creation of ladies' committees, and from that portion of the work much is expected, as, after all, it is in the home that the use of South African products must first be encouraged. In this connection we would point out that several societies—the Women's Industrial Union and others—are working for the same ends as the National Union has in view, and a concentration of effort might lead to larger results with stricter economy of labour.

It is satisfactory to find the Union intends to demand the *standardisation* of articles offered for sale by South African manufacturers; the absence of which is the weak point in those societies run on more or less philanthropic lines. It is well known that the ordinary consumer seldom introduces sentiment into his purchases, and must, therefore, be first convinced of the excellence and uniformity of quality of the article offered.

The Union has, however, before it the larger work of surveying South Africa as a whole, and should arrange to draw on the surplus of one part of the country to supply the wants of another. With the development of our railway system, for example, it is now possible to use Rhodesian teak in Capetown, and with the varied conditions of climate, and the enormous extent of British South Africa, a large internal trade must eventually be developed: this can be brought about much sooner if taken up by the Union than if left to individual efforts.

The subscription has been fixed at the moderate sum of 5s. per annum, and our readers cannot do better than support a scheme which is designed to increase the material wealth of the country and the prosperity of each individual. The Secretary, Mr. H. E. King, P.O. Box 335, Pretoria, will be glad to register the names of any who would like to join the Union.

Promotion of Trade between Holland and South Africa.

We have received a circular from the Commission appointed to promote better trade relations between Holland and South Africa. The Commission will be glad to advise any person as to new markets for South African products in Holland, and also in the neighbouring markets of the Continent. The Commission will try to promote the interests of the produce of the Netherlands, which is so well known on the world's markets, and will always be glad to listen to any suggestions to this end. Should any complaints arise, the Commission will consider it their earnest duty to use their influence to sustain the good name of Dutch commerce.

The members of the Commission are:—

F. C. Stoop, Esq., Chairman, Netherlands Chamber of Commerce, London.

K. F. van den Berg, Esq., Director of the Netherlands Bank of South Africa, Amsterdam.

O. Kamerlingh Onnes, Esq., Director of the Bureau for Commercial Information, Amsterdam.

The Secretaries are:—

M. W. Roosegaarde Bisschop, Esq., Secretary of the Netherlands Chamber of Commerce, London.

H. C. Obreen, Esq., 36 Lange Houtstraat, The Hague, Secretary to the Commission for Commercial Policy.

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Fresh Colonial Produce.

THE General Manager of the C.S.A.R. has kindly forwarded—and asked us to publish for the benefit of the farming population—a copy of certain instructions issued to his staff relating to the supply of fresh Colonial produce.

In connection with the monthly list of "Fresh Colonial Produce direct from the Farm," the prices for all produce must be quoted definitely as far as possible, and it should be pointed out that no good purpose is served by stating that prices can be obtained "on application," or that the produce will be sold "at market prices." The latter term is mis-leading, seeing that no particular town is referred to, and market rates in every place fluctuate considerably according to the local demands ruling at the time. It is evident that sufficient care has not been taken in the past to explain the advantages of the use of this departmental list, viz., the encouragement of direct transactions between the producer and consumer.

* * * *

The farming community should be informed that unless the prices compare favourably with, or are slightly below, the current market rates of any individaul town, little or no business will result, the public naturally buying in the cheapest market, provided the excellence of the produce is assured. By means of the c.o.d. system, the farmer is enabled to ensure the receipt of his cash at a minimum of risk and trouble to himself. The agency fees, market or otherwise, are saved to the farmer, whereas the railage and delivery fees are additional charges to the consumer. It is, therefore, evident that to establish a connection between town consumers and country producers, the seller must offer such inducements as will create a demand and build up trade between different centres.

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Instructions to Station Masters.

To enable farmers to ascertain what would be a fair price to demand for their produce station masters will always be able to ascertain from the office of the Manager the average ruling market price for the past week in Bloemfontein, Pretoria, or Johannesburg. The farmers will not be slow to appreciate the advantages of having neither market nor agency fees to pay, and with particulars of railway rates from his station and delivery charges at the other end, which are paid by the consumer, it should be an easy matter for the farmer to arrange such prices as will induce the public to take the opportunity by this system of a direct supply of fresh produce from the farms.

Station masters should endeavour to induce farmers to quote low prices for quantities taken regularly, say, for six months, or a year, e.g. prices for 5 lbs. or 10 lbs. of butter, sent weekly for a long period from a station to a regular customer, should be quoted at a lower rate than the average price ruling for that period.

* * * *

Spineless Cacti.

THE Division of Botany has received, as an exchange with the United States Department of Agriculture at Washington, two cuttings of Mr. Luther Burbank's new spineless Cacti, namely, *Opuntia anacantha* and *Opuntia morada*. These will be propagated at the Botanical Experiment Stations, but two seasons will probably elapse before cuttings will be available for distribution to farmers.

* * * *

Wood for Match-making.

MR. C. E. LEGAT, Conservator of Forests, writes:—"With reference to the notice in the *Agricultural Journal* No. 22 (January, 1908), stating that the Lion Match Company, Durban, were prepared to purchase poplar wood, I learn that Mr. A. Vorbeck, Clercqsvallei, P.O. Bonnefoi, offered to supply between four and six hundred logs of a suitable size on the 18th March last, and that the company wrote back saying they could not possibly take any wood at present, as they had a very large stock which would take some months to work down. It is, therefore, well to warn our farmers that this company is overstocked at the present moment."

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Wattle Bark Tannin.

SPEAKING of the paper on "Wattles," which appeared in the last number of the *Agricultural Journal*, it may be of interest to note that samples of bark from black wattle and green wattle trees, grown close together on the farm of Mr. J. Forbes, Athole, near Amsterdam, have been submitted to the Chief Chemist, who has analysed them with the following results:—

	Green Wattle.	Black Wattle.
Tannin matter	33.20 per cent.	32.66 per cent
"Non tannins".. ..	14.13 ,,	11.60 ,,
Total extract ..	47.33 per cent.	44.26 per cent.

There is thus practically no difference in the tannin contents of the samples examined thus far.

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The First Stone Silo in the Transvaal.

THE last plate in this issue is a photograph of the first stone silo erected in the Transvaal, the credit of which belongs to Mr. van der Byl, of the Irene Estate. This silo is built of dolomite, plastered with cement and bolted with angle irons—made from old wagon tyres—to prevent the walls from bulging out. From the illustration it will be seen that the outside is of rough stone, which gives the building a most attractive appearance, and there are also corrugated glass windows, which admit an ample supply of light. The cutter can dispose of from five to eight tons of ensilage per hour.

Mr. Van der Byl has two pedigree Ayrshire bulls and a mixed herd of Friesland and Cape cows. He believes greatly in a balanced ration, and makes use of lucerne, hay, forage, and velvet beans in feeding.

By means of this silo, thirty cows can be fed for, approximately, six months. The capacity of this silo is, roughly, 120 Cape tons, or 240,000 lbs. Now, a cubic foot of ensilage weighs, approximately, 40 lbs., and is sufficient, along with a little hay, for one day's ration. Therefore,

$$30 \times 40 = 1{,}200 \text{ lbs. per day.}$$
$$240{,}000 \div 1{,}200 = 200 \text{ days.}$$

That is, 120 tons of silage will feed 30 cows with 40 lbs. each per day for a period of 200 days, or a little over six months.

* * * *

The British Association Medal.

We are glad to be able to announce that the medal and fund raised in commemoration of the British Association's visit to South Africa, for scientific work in South Africa, has been awarded to Dr. Arnold Theiler, C.M.G., Government Veterinary Bacteriologist to the Transvaal, for his distinguished services to the science of bacteriology. We are sure all our farmers will unite with us in heartily congratulating the genial doctor on his latest honour.

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Tobacco-growing in Sumatra.

Mr. H. W. Schneider, of Pretoria, who was at one time a tobacco planter in the Dutch East Indies, has kindly forwarded us some statistics, from which we extract a few figures, showing the progress of the tobacco industry in this part of the world. The Arendsburg Tobacco Company report as follows: The harvest for the year 1906 was 11,525 bales of tobacco, with a net profit of £126,334. The reserve account still stands at £84,000; a dividend of 170 per cent. was declared, while moneys were added to the pension fund, etc. Mr. E. J. Mullins, also a former planter in Sumatra, has prepared a most instructive table, which shows in a striking manner the remarkable growth of this industry during the past forty-two years. We abstract the following:—

Sumatra Tobacco Sales.

	Bales.	Value.
1864	50	£333 6 8
1906	248,441	£5,133,333 6 8

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Tenders to Purchase the Government Estate and Factory at Tzaneen.

We desire to draw the attention of our readers to Government Notice No. 558 of 19th June, 1908:—

It is hereby notified for general information that tenders for the purchase of the Government Estate and Tobacco Factory at Tzaneen, near Haenertsburg, will be received by the Minister of Agriculture, Pretoria, up to 12 noon on Friday, the 21st August, 1908; tenders to be sealed and marked "Tender for purchase of Government Estate and Factory, Tzaneen."

The estate comprises the following farms, all situate in the District of Zoutpansberg:—

Tweefontein No. 864, Smitstad No. 797, Zomerkomst No. 1896, Dwarsfontein No. 1902, Gelukfontein No. 1918, Vergelegen No. 1903,

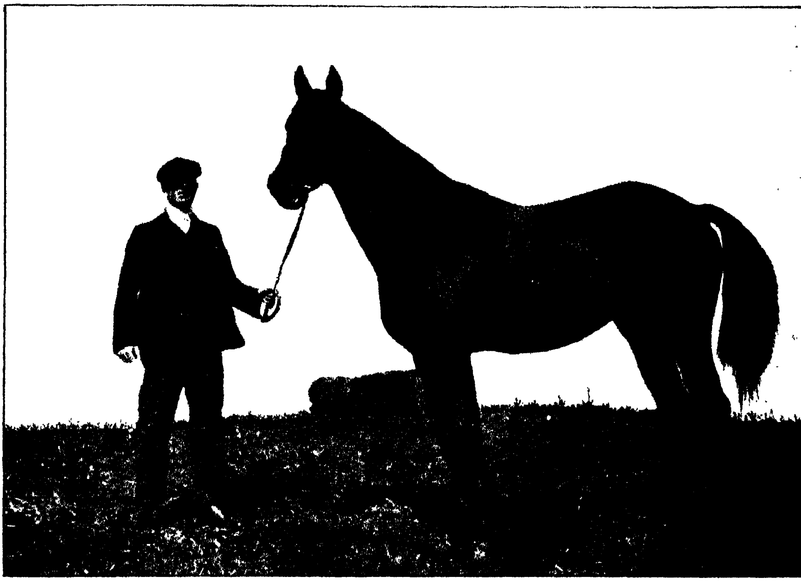

Fig. 1.

Plate 9b. Fig. 2.

Fig. 1. "Chesney": Winner of Champion Prize for Best Thoroughbred Stallion, Witwatersrand Agricultural Show.
Fig. 2. "Pearl Queen": Winner of Champion Prize for Best Thoroughbred Mare, Witwatersrand Agricultural Show, 1908.

Exhibited by Mr. Henry Nourse.

Fig. 1.

Plate 96.

Fig. 2.

Fig. 1. "Endymion": Winner of First Prizes at Ermelo and Carolina Agricultural Shows in 1907 and 1908, and of the Champion Cup in Ermelo each year.

Fig. 2. "Eschscholtzia": Winner of First Prize and Champion Cup for Thoroughbred Mare at the Ermelo Agricultural Show, 1908.

Owned by Mr. T. Everard, Carolina.

Plate 97.

Agricultural Machinery.

Pretoria Agricultural Show.

Vlakfontein No. 1633, Morgenzon No. 2047, Leliefontein No. 796, Krabbefontein No. 1899, Spitzkop No. 1900, Grootboom No. 1901, Grenzhoek No. 1904, Grootland No. 2403, Middelkop No. 2305, portion of Turksvijgbult No. 2081, and is, approximately, 4,650 morgen in extent.

The factory is complete in every respect, and is fitted with the most up-to-date machinery, equipment and plant for the manufacture of tobacco, cigars, cigarettes, and snuff. The buildings necessary for the working of the factory and estate have been erected.

Further particulars regarding the estate and form of tender, which must be signed by the tenderer and two sureties approved by the Minister of Agriculture, may be obtained on application to the Director of Agriculture, Pretoria. A deposit of £3 3s. must be sent, but this will be returned on receipt of a bona fide tender.

The Government does not bind itself to accept the highest or any tender.

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Importation of Hay into Great Britain prohibited.

A DOCUMENT has just been received by the Right Hon. the Minister of Agriculture from the Colonial Office to the effect "that certain inquiries have been addressed to the Board of Agriculture and Fisheries as to any restrictions on the importation into Great Britain of hay from South Africa, including Rhodesian hay shipped via Beira, and that the Board have replied that, in view of the risk of the spread to farm stock in Great Britain of the disease known as East Coast Fever through the medium of such hay, they would be obliged to take steps, under the Diseases of Animals Acts, 1894 to 1903, to prevent its importation unless, and until, they were satisfied that the disease had been eradicated from South Africa. Further, they request that the Board be informed of any shipments of hay to Great Britain; and that intending exporters should be warned prior to the shipment of hay that it is probable steps would be taken by the Home Government to prevent its being landed in Great Britain."

* * * *

Also into Australia.

THIS was our first warning delivered with the courteous dignity of an official minute sent out by the Imperial authorities. But the second came with dramatic suddenness. To-day, we read that the Australian Government has cabled to Capetown that they cannot permit the landing of Cape oat-hay. It would seem that consignments to the tune of £20,000 are already on the sea. For us the moral is perfectly plain. So long as disease of any sort exists in the Transvaal the markets of the world will not be freely opened to our products.

* * * *

The Value of Veterinary Science.

FORMERLY, it was not uncommon to find some people who held the opinion that veterinary officers were not necessary to the progress and well-being of the agricultural industry. In the Transvaal, however, we are glad to believe that this view no longer prevails. But if any lingering doubt remains in the minds of the more conservative farmers regarding the need of expert advice with reference to disease, it will certainly be removed by the perusal of those warnings which we have just noted from two widely separated portions of our Empire.

It is only the other day—at the Potchefstroom Agricultural Show—that General Botha insisted upon the imperative need of sound scientific advice. And for the sake of the material prosperity of our Colony it is surely our clear duty to uphold the hands of the Government, and the Veterinary Division of the Department of Agriculture, in their struggle to eradicate disease, and so ultimately to present the country with a clean bill of health.

Soils How to Handle and Improve them.

We would like to call the attention of our farmers to two recently published books. The first is entitled "Soils: How to Handle and Improve Them," by S. W. Fletcher, Professor of Horticulture in the Michigan Agricultural College (published by Messrs. Archibald Constable & Co., Ltd., London). It is a matter of eight years since we first met Dr. Fletcher at Cornell. Then he had just published an excellent monograph on "Pollination in Orchards." That his industry in the field of agriculture has not grown less with succeeding years is fully shown by his present volume, which is a model of what an agricultural textbook should be. Professor Fletcher writes in an interesting and lucid manner regarding the treatment of soils; and his many practical hints will appeal with as much force to the South African farmer as they must do to the American agriculturist. The book is beautifully printed, fully illustrated, and should be in the library of every farmer in the Transvaal.

The New Agricultural Literature.

Dr. Fletcher's preface sets forth so clearly the new spirit in American agricultural literature that we need not apologise for quoting it in full:—

"Many of the early books on farming were written in a technical style. They smacked of the lecture room and the library rather than of the soil. They were scholarly rather than practical. A spirit of directness and simplicity is beginning to dominate agricultural literature. The modern type of farm books is born of actual contact with the soil and a desire to be of service to the men who are getting a living from the soil. They are democratic: they discuss common things in a plain way. The long and tedious tables of figures in the old books are giving place to crisp summaries The technical lecture-room phrases are replaced by words in common use on farms. The idea is not to present less science—for nothing is so practical as sound science—but to present science in a simple and practical way. This new spirit is contemporaneous with the farmer's institute, the farmer's reading-course, nature-study, elementary agriculture in the public schools and other efforts to serve the man who tills the soil. It is an expression of a general movement which aims to democracise agricultural teaching.

"This book is an attempt to set forth the important facts about the soil in a plain and untechnical manner. It is not a contribution to agricultural science, but an interpretation of it—a new presentation of what is already known."

Farm Live Stock of Great Britain.

THE second book of which we wish to speak comes from the pen of a Scottish agriculturist. To a native of Edinburgh it must always seem strange that the *Modern Athens* should produce the most notable publication on the subject of British live stock during the past decade. But it only goes to show how the ancient Universities are at last realising that the student of to-day desires something more than the old Humanities, as the classics were wont to be called. The occupant of the Chair of Agriculture and Rural Economy in the University of Edinburgh, Professor Wallace, has done agriculture and stock breeding a signal service in republishing and bringing up to date his well-known work on "Farm Live Stock of Great Britain" (published by Oliver & Boyd, Edinburgh). This volume consists of 758 pages and over 400 plates. The illustrations are singularly good and clearly demonstrate that the too common method of snap-shotting animals with an indifferent camera on the off-chance of getting one fair photograph out of a bunch of twenty or thirty is giving place to a more exacting science. To place an animal carefully and properly before a camera calls for a knowledge both of the points of the beast in question and of the principles of photography. In Scotland this art has been brought to a high pitch of perfection by Mr. C. Reid, of Wishaw, many of whose photographs adorn the book under review.

In short, we can cordially commend Professor Wallace's admirable volume to the readers of this Journal. Incidentally, the author, on page 127, in his chapter on the Devon breed, remarks :—"*The colour, as well as the head and forward part of the body of the Africander cow is so Devon-like that a speculative belief, based on no trustworthy evidence, exists that the Devon breed must have contributed to its formation.*" It would be of interest to know whether our own stock-breeders are prepared to confirm or reject this theory.

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Farms Open for Lease.

MR. H. A. BAILY, the secretary of the Transvaal Landowners' Association, has kindly sent us a copy of the handbook which has been published with the object of assisting in the development and settlement of the Transvaal. It contains a list of farms owned by the various members of the association available for white occupation. The brochure is published with the hope that it will prove of practical benefit to landowners and prospective tenants by bringing to the notice of the latter farms which are available and the channels through which they can be obtained. The terms and conditions upon which the members of the association owning farms are prepared to enter into leases with desirable tenants seem very favourable. It is well to point out that nearly all the farms mentioned in the handbook consist of virgin veld, and provision must be made for the erection of dwelling-houses and kraals. The list includes farms of every description ; a few are situated in the high veld, but the majority are in the middle and bushveld of the more northern districts of the Transvaal. Prospective tenants are advised not to decide on a farm until they have been thoroughly satisfied as to the possibilities of the locality in which it is situated. Any general information which is required can be obtained from Mr. H. A. Baily, P.O. Box 1821, Johannesburg.

The Cereal Rusts.

We have recently received a monograph on the cereal rusts by Mr. I. B. Pole Evans, plant pathologist to the Department. This paper which has been reprinted from the "Annals of Botany" (Vol. XXI, No. lxxxiv, October, 1907), is a strictly technical piece of research, and contains forty-four admirably executed microscopic drawings by the author, showing the various stages in the life history of the rust spores.

This work was begun in the year 1903 in the University of Cambridge under the direction of the late Professor Marshall Ward, and has since then been continued in the Botanical Laboratory of the Department in Pretoria.

The labour involved in the preparation of such a monograph will be more readily realised when we observe that the cereal rusts—or *Puccinia*—have been sub-divided into thirteen different species, each of which has some well-defined morphological and physiological characteristic; and, further, that they have been classified into no less than twenty-four different forms, each showing a special adaptation to particular host plants.

* * * *

Although the rust termed *Uredo graminis* has probably received more attention from mycologists than any other parasitic fungus, Mr. Pole Evans has shown, by means of his excellent drawings, for the first time the complete sequence of infection which has not hitherto been observed or represented. Every now and again the farming world is thrown into a state of excitement by the announcement of a new rust-resisting wheat, but the authors of these sensational rumours can hardly understand the years of arduous training which are necessary to the proper study of these fungous diseases which lay waste our farm crops. We heartily congratulate Mr. Pole Evans on this record of his preliminary researches, which are a credit alike to himself and to the Department of Agriculture.

Agricultural Statistics.

What shall be Our Share?

In 1906 Great Britain Imported :—

Grain, Corn and Flour	£67,881,000
Meat—Alive and Dead	£52,026,000
Wool	£27,447,550
Total ...	£147,354,550

WHAT DO YOU PRODUCE?

★

Average Size of Farm :—

In Great Britain...	63 acres.
In America ...	146 acres.
In TRANSVAAL	5,000 acres.

DO YOU KNOW

That one-tenth of the Transvaal under Maize would supply England for one Year?

FIGURE IT:

Maize Imported into England (1906)	5,452,742,400 lbs.
ONE-TENTH OF TRANSVAAL...	7,100,000 acres.
At 4 bags per acre	28,400,000 bags.
	= 5,680,000,000 lbs.

WHEAT!

How Much can We Supply?

Great Britain needs each Year—

262,700,000 bushels.

Worth £45,000,000.

AGRICULTURAL NOTICES.

Veterinary Division.

ARRANGEMENTS FOR FORWARDING PATHOLOGICAL SPECIMENS.

It is hereby notified for general information that special arrangements have been made with the Central South African Railways for forwarding pathological specimens for examination in the Veterinary Bacteriological Laboratory, and all such specimens can now be sent carriage forward, if addressed to the Government Veterinary Bacteriologist, Pretoria Station, and distinctly labelled "Scientific Specimens for Examination." The Government Veterinary Bacteriologist is at all times glad to make examinations and to report on pathological specimens, but farmers and others sending such are earnestly requested to write full particulars of the animal from which the specimen has been taken and to post such in time to be delivered before the arrival of the specimen, or, in case of urgency, to telegraph. The importance of doing this is urged since occasionally, when not previously advised, specimens have arrived in too decomposed a condition for examination.

F. B. SMITH,
Director of Agriculture.

Office of the Director of Agriculture,
1st October, 1907.

* * * *

SPONZIEKTE OR QUARTER EVIL.

Vaccine for the prevention of this disease is now ready for issue at the Government Veterinary Bacteriological Laboratory, and can be obtained through the Government Veterinary Surgeons, who will give instruction in the method of vaccination, and through whom also the necessary instruments can be obtained. The price of the vaccine is 3d. per double dose.

* * * *

WARNING TO IMPORTERS.

The attention of the Department has been directed to the fact that certain imported cattle brought into this country under certificates stating that they have been tested with Tuberculin before shipment and have passed the test satisfactorily, have been found to react as infected when re-tested by the Government Veterinary Staff shortly after arrival. For this reason it is suggested that importers of cattle should have such imported animals re-tested by a Government Veterinary Surgeon on arrival at their destination, and before they are allowed to mix with other stock. Should anyone wish to take this precaution the test will be applied free of charge upon application to the Government Veterinary Surgeon of the District to which the cattle are taken, at the earliest convenience of this Officer to whom the application is made.

F. B. SMITH,
Director of Agriculture.

* * * *

PORTS FOR ENTRY OF STOCK.

The following are the ports for entry of stock into this Colony from the neighbouring territories:

Bilhrman's Drift	Cape Colony.	(Daily.)
Mosimyani	,,	(Saturdays only.)
Christiana	,,	(Daily.)
Fourteen Streams	,,	(Wednesdays only.)
Coal Mine Drift	Orange River Colony.	(Thursdays only.)
Vereeniging	,,	(Daily.)
Schoeman's Drift	,,	(Mondays & Thursdays.)
Roberts' Drift	,,	(Daily.)
De Lange's Drift	,,	(Tuesday.)
De Villiers Drift	,,	(Friday.)
Volksrust	Natal.	(Daily.)
Komati Poort, through which stock not provided for under Clause 5, Government Notice No. 834 of 1903, will only be allowed to proceed by rail, to be examined at Machadodorp	Portuguese East Africa.	

Division of Chemistry.

SCHEDULE OF CHARGES FOR ANALYSIS MADE IN THE AGRICULTURAL LABORATORIES.

	£	s.	d.
1. Estimation of one constituent in a manure or feeding stuff ..	0	7	6
2. Estimation of two or three constituents in a manure or feeding stuff	0	15	0
3. Complete analysis and valuation of a manure or feeding stuff ..	1	0	0
4. Analysis of water—drainage or irrigation	1	5	0
5. Partial analysis of a soil to determine fertility and manurial needs	2	0	0
6. Complete analysis of a soil	3	0	0
7. Analysis of milk, cream, butter, or cheese	0	10	0
8. Milk—determination of fat and total solids	0	5	0
9. Milk—determination of fat only	0	2	6
10. Butter—determination of water and fat	0	5	0
11. Analysis of a vegetable product—hay, ensilage, roots, etc.	1	0	0

At present no charge will be made to *bona fide* farmers. The charges in the above schedule refer to products sent by manure merchants, milk dealers, or others interested in trade. Samples will only be accepted if assurance can be given that they are properly taken and truly representative of the bulk. The right of publishing the results of any analysis is reserved by the Department. Should the examination of any product furnish results which are deemed of sufficient general interest, the charges may be remitted.

Samples of any product likely to be of agricultural importance will gladly be received.

Division of Botany.

INJURIOUS WEEDS.

Owing to the fact that of late several newly-introduced and injurious weeds have made their appearance in the Transvaal, farmers are earnestly requested to take careful notice of any new plants which have appeared on their farms and which seem to have a tendency to spread. When such are discovered, specimens of the plant bearing flowers and, if possible, fruit should be forwarded to the Government Botanist by whom they will be examined and reported upon. They should be forwarded in the same way as specimens of poisonous plants.

* * * *

COCKLE-BURR.

On account of the dangerous character of this weed to wool and mohair growers, farmers on the Aapjes, Pienaars, and Crocodile Rivers are advised to keep a sharp look-out for its appearance, especially on the banks of the rivers, and to root out the plants before they scatter seed. Any farmer who is in doubt as to the identity of Cockle-Burr can send specimens to the Botanist for identification.

Division of Forestry.

SALE OF HEDGING FROM IRENE NURSERY.

It is hereby notified for general information that the sale of Hedge Plants from Irene Government Nursery has been discontinued. Forest trees will be disposed of as formerly.

* * * *

The price list of seeds and trees supplied by this Division can be obtained free of charge on application to the Conservator of Forests, or the Government Printer, Pretoria.

Division of Horticulture.

CONTINUATION OF NURSERY WORK BY THE HORTICULTURAL DIVISION.

The present opportunity is taken of notifying farmers generally that the propagation of young fruit trees for sale at the various Experimental Orchards and Nurseries of this Division will be re-commenced immediately, but trees will not be available for disposal until July, 1909. By this date it is expected that a good number of trees will be available, and they will comprise such varieties as have proved to be suitable for the various districts of the Transvaal by actual test at the different Experiment Stations.

* * * *

SALE OF FRUIT TREES, VINES, CUTTINGS, SCIONS, ETC.

It is notified for public information that in future payment must be made for goods on or before delivery. When purchasers mention a railway station to which packages may be consigned for them, advantage may be taken of the "Collect on Delivery" system of the C.S.A.R. In all other cases cash should accompany the order, but it is advisable prior to remitting same that enquiries be made of the Government Horticulturist as to the ability of the Division to supply the trees ordered.

Tobacco Division.

TOBACCO PLANT DISEASES.

A large number of letters and verbal inquiries have been received by the Tobacco Division in regard to diseases and insects injurious to tobacco plants. It is impossible to give any reliable advice as to remedies for different diseases and insect pests unless a specimen of the affected plant is forwarded to us, and our readers are, therefore, requested to furnish a portion of the affected plant when writing for advice in such matters. Most of the diseases and insect pests which attack tobacco plants in the Transvaal are easily controlled. Letters, but not parcels, may be sent free of charge if addressed as follows :—

O.H.M.S.
Chief of Tobacco Division,
Department of Agriculture,
Pretoria.

Experimental Farm, Potchefstroom.

SEEDS FOR DISPOSAL.

Potatoes.—

Price 15s. per bag of 160 lbs. net f.o.r. Potchefstroom.
Varieties :—
Early—Early Rose.
May Queen.
Epicure.
Late—Langworthy,
African Red,
Scottish Triumph,
Up-to-date,
Duchess of Cornwall,
Factor,
Chas. Fidler,

and small quantities of several other varieties.

The early varieties will be ready for disposal in July and August, and the late varieties in September and October.

Artichokes (seed).—

Price 15s. per 100 lbs., f.o.r. Potchefstroom.

Oats.—

Price 10s. per 100 lbs., f.o.r. Potchefstroom.
Varieties :—"White Egyptian" and "Algerian."

Plate 98.

Poultry Runs,

Potchefstroom Experimental Farm.

Plate 69.

Velvet Beans.

(*Mucuna utilis.*)

Ensilage-making on the Irene Estate.

Barley.—

Price 12s. 6d. per 100 lbs., f.o.r. Potchefstroom.

Variety: —"Kinver Chevalier" (for malting purposes)

Rye.—

Price 12s. 6d. per 100 lbs., f.o.r. Potchefstroom.

Variety:—"Early."

Maize or Mealies.—

Price 20s. per 100 lbs., f.o.r. Potchefstroom.

The following varieties, after having been thoroughly tested on this farm, are recommended. The kind of climate and the district in which the mealies are planted is the chief factor which determines the varieties which are suitable for that district.

Applicants who are not acquainted with the characteristics of the different varieties are recommended to leave the selection to the undersigned, who will forward seed of those varieties which are likely to give the best results in the district in which they are to be planted.

Colour.	*Name of Variety.*	*Maturation.*
White	Natal White Horsetooth	Very late.
	Virginian Horsetooth	Late.
	Hickory Horsetooth	Late.
	Brazilian Flour Corn	Late.
	Hickory King (8 row)	Medium late.
	Iowa Silver Mine	Medium.
	White Cango	Medium.
	Champion White Pearl	Medium early.
	White Botman	Medium early.
	Thoroughbred White Flint	Early.
Yellow	Golden King	Late.
	Hawkesbury Champion	Late.
	Austen's Colossal Yellow Dent	Late.
	Yellow Hogan	Late.
	Yellow Flint (8 row)	Medium late.
	Yellow Cango	Medium late.
	Natal Yellow Flint	Medium.
	Early Butler Corn	Medium.
	Eureka Field Corn	Medium early.
	Early Star Leaming	Medium early.
	Chester County Mammoth	Early.
	Ninety Day	Early.

The whole of the seed offered is shelled from carefully selected and hand-picked cobs, true to the type and character of each variety. The greatest care is taken to ensure uniformity in the seed by "topping" and "tailing" the cobs, and by hand-picking. Some varieties are inclined to be unstable in their characteristics, and in other cases the effects of cross-fertilisation may not be apparent. These conditions have been reduced to a minimum as far as care in the growth and selection of the seed will permit.

Sorghum (Saccharatum).—

Price 3d. per lb., f.o.r. Potchefstroom. Sow 12 to 15 lbs. per acre.

Broom Corn.—

Price 3d. per lb., f.o.r. Potchefstroom. Recommended for growing material required for making brooms. Sow about 8 lbs. per acre.

Mannas or Millets.—

Price 6d. per lb., f.o.r. Potchefstroom.

Variety.	*Maturation*
Californian Golden Moha.	Very early.
Golden Millet.	Medium early.
"Boer."	Late.

The price of any of these seeds may be altered without notice.

The quantity of these seeds which will be issued to any one farmer will be determined by the applications received, and allotment will be made according to priority of application. *Orders must be accompanied by cheque or postal order.* For full particulars and any other information apply to the General Manager, Experimental Farm, Potchefstroom.

ALEX. HOLM,
eneral Manager.

NOTICE REGARDING PUBLIC MARES.

It is hereby notified that the Right Hon. the Minister of Agriculture has decided to discontinue the practice of taking mares to public stud. There will now be available for lease 17 stallions, a list of which is appended hereunder. All applications for these stallions should be sent to the General Manager, Government Stud Farm, Standerton, not later than 31st July. Persons wishing to inspect the stallions can do so by giving two days' clear notice to the General Manager. The Stud Farm is about 10 miles from Standerton. Telegraphic address: "Horses," Standerton.

GOVERNMENT STALLIONS FOR LEASE—SEASON 1908-9.

Name of Stallion.	Pedigree.	Leasing Fee.
Sir Reginald, brown ...	Hagioscope—The Empress Maud	£50
Toredo, chestnut ...	Torpedo—Thetis	£50
Florismart, dark bay ...	Martagon—Floranthe	£50
Anchovy, bay	St. Michael—Sauce	£50
Breakaway, black ...	Prisoner—Panama	£40
Our Jack, brown ...	Sheet Anchor—Dalliance	£30
Cairnryan, bay ...	Enthusiast—Finnart	£45
D'Arcy, bay	Ayrshire—Cosy	£50
The Orphan, brown ...	Dick Swiveller—Beehive	£35
Queen's Jubilee, chestnut	Queen's Birthday—Queen of the Florin ...	£45
Mon Roy, chestnut ...	Orme—Mon Droit	£50
Candil, chestnut ...	Sargento—Vhalia	£35
Voltaire, brown ...	Warpath—Maythorn	£35
Tarrone, bay	Redcourt—Lottie	£30
King Fish, brown ...	Fly Fisher—Little Nell	£30
Kennythorpe, brown ...	Calthorpe—Kenny	£40
Little Dick, dark bay ...	Dick Swiveller—Magenta	£40
The Don	Catalonian Jack	£40

Editorial Division.

AVAILABLE PUBLICATIONS.

The following publications can be had, free of charge, on application to the Government Printer, Box 373, Pretoria:—

Transvaal Agricultural Journal, No. 3, Vol. I. (Published quarterly).
" " " **No. 4, Vol. I.** " "
" " " **No. 13, Vol. IV.** " "
" " " **No. 14, Vol. IV.** " "
" " " **No. 15, Vol. IV.** " "
" " " **No. 16, Vol. IV.** " "
" " " **No. 17, Vol. V.** " "
" " " No. 18, Vol. V. " "
" " " No. 21, Vol. VI. " "
" " " No. 22, Vol. VI. " "
" " " No. 23, Vol. VI. " "

Division of Botany:—

Leaflet No. 1.—"Plants Poisonous to Stock."
„ No. 4.—"The Cockle-Burr."
„ No. 6.—"Peach Leaf Curl."
Bulletin No. 1.—"The Conditions of Seed and Plant Distribution," 1906-7.
„ No. 2.—"The Conditions of Seed and Plant Distribution," 1907-8.
Circular No. 1.—"Poisonous Plants."

Division of Entomology:—

Leaflet No. 5.—"The Fowl Tick."
„ No. 6.—"Cockchafers and Flower Beetles."
„ No. 7. "Sprays for Locust Destruction."
„ No. 10.—"Notes on Termites."
„ No. 11. "The Scale Insects of Citrus Trees."

Division of Forestry:

"Price List of Seeds and Trees."

Division of Horticulture:—

Bulletin No. 1. "Some Information about Fruit Trees."
Leaflet No. 3.—"A Fruit Report."
„ No. 4.—"Diseases of Orange Trees."

Division of Dairying:—

Leaflet No. 1.—"The Making of Full-Cream Gouda Cheese on a Dutch Farm."
„ No. 2. "Treatment of Milk."
Circular No. 1.—"Breakfast Cheese."
„ No. 2. "Rennet Making."
„ No. 3.—"Buttermaking."

Division of Veterinary Science:—

Bulletin No. 1. "Measles in Swine and Cattle."
„ No. 6.—"Contagious Abortion."
Leaflet No. 3. "Rhodesian Tick Fever."
„ No. 5. "Glanders and Farcy."
„ No. 1. "Directions for Preparing Blood Smears."
„ No. 6. "Wire Worms."
„ No. 7.—"Directions for Use of Blue Tongue Vaccine."

***Division of Publications*:—**

Bulletin No. 1.—"Burrweed or Boete Bosch."
„ No. 2.—"Some Diseases of the Horse."
„ No. 3.—"The Food of Plants."
„ No. 6.—"City and Town Milk Supply and the Care and Aeration of Milk."

Farmers' Bulletins:—

Farmers' Bulletin No. 1. "Maize Foods for the Home."
Farmers' Bulletin No. 2.—"Notes on Tobacco."
Farmers' Bulletin No. 3. "Notes on Lucerne Growing."
Farmers' Bulletin No. 4.—"Smut in Wheat, Barley, and Oats."
Farmers' Bulletin No. 5.—"Insect Enemies of Mealies in the Transvaal."
Farmers' Bulletin No. 6.—"How to secure Good Seed Maize."

***Miscellaneous*:—**

Bulletin No. 3.—"The Brands Directory, 1906."
Annual Report of the Director of Agriculture for the year 1903-4.
„ „ „ „ „ 1904-5.
„ „ „ „ „ 1905-6.

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JOURNAL FILES.

In order that our numerous readers may not be disappointed by being unable to complete their files, we would earnestly request them to preserve all copies of the "Journal" if they propose to bind them at the close of the year. Owing to the expense incurred in publication, it has become necessary to limit the number of copies issued, and it often happens that we cannot supply back numbers, as they are out of print.

Indices for the "Agricultural Journal," Vol. I., Vol. II., Vol. III., Vol. IV. and V., can be had on application to the Department of Agriculture.

JOURNAL DUPLICATES.

Any readers who possess and can spare duplicates of the "Agricultural Journal" would confer a great favour by returning them to the Department of Agriculture, as back numbers are now out of print, and applications are constantly being made by persons desirous of completing their sets.

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APPLICATIONS FOR THE "JOURNAL" AND NON-DELIVERY.

Applications to be placed on the Mailing List of the "Journal," as well as complaints as to non-delivery of the "Journal," should be addressed to the Government Printer, P.O. Box 373, Pretoria, and not to the Editor of the "Journal." It is particularly requested that changes of address should also be promptly notified to the Government Printer, in order to ensure prompt delivery to addressees and to avoid unnecessary correspondence.

"The Transvaal Agricultural Journal" is issued free to residents in the Transvaal only.

Persons residing in the other South African Colonies or Oversea may become subscribers by paying an annual subscription of 7s., post free, starting from July in each year; 2s. extra is required for postage oversea.

Subscriptions are payable strictly in advance, and should be made by bank draft, money order, bank notes, or coin. Cheques cannot be accepted in payment, unless initialled by the Bank authorities.

All correspondence must be addressed and payments made to the Government Printer, Box 373, Pretoria.

General Notices.

LIST OF FARMERS' ASSOCIATIONS AND AGRICULTURAL SOCIETIES IN THE TRANSVAAL.

Aapjes River Ward Agricultural Society, A. F. van Gass, Pyramid Station
Aapjes River Ward Farmers' Association, F. N. Carlisle, Pyramid Station.
Barberton Farmers' Association, Geo. E. O. Wilhelm, Box 157, Barberton.
Barberton Agricultural Society, G. S. Dyce, Box 5, Barberton.
Belfast Agricultural Society, O. J. Oosthuizen, Box 13, Belfast.
Bloemhof Agricultural Society, Izaak Hoffmann, Bloemhof.
Carolina Agricultural Society, M. van Enter, Box 43, Carolina.
Christiana Agricultural Society, A. P. Burgers, Box 27, Christiana, Secretary.
Crocodile River Farmers' Association, J. H. Schoeman, Rietfontein W., Pretoria.
Devon Farmers' Association, J. H. R. Moodie, P.O. Devon.
Eastern Transvaal Farmers' Association, T. W. Snaith, Box 75, Springs.
Ermelo Agricultural Society, A. Smuts, Box 5, Ermelo.
Elands River Farmers' Association, E. H. Eloff, Rietvlei, Lindley's Poort, Rustenburg.
Grootspelonken Farmers' Association, J. W. Walton, Private Bag, Middagzon, Pietersburg.
Haenertsburg Farmers' Association, P. Kent, Spitzkop, Haenertsburg, *via* Pietersburg.
Heidelberg Agricultural Society, W. Harvey, Box 36, Heidelberg.
Heidelberg Burgher Land Settlements, Balfour.
Hekpoort Farmers' Association, Secretary, *via* Krugersdorp.
Hex River Farmers' Association, W. Breedt, Hex River, Rustenburg.
Highveld Farmers' Association, F. Findley, Ceylon, *via* Krugersdorp.
Highveld Farmers' Association, W. Robinson, Rustenburg.
Klerksdorp Agricultural Society, H. Bramley, Box 56, Klerksdorp.
Klip River Farmers' Association, Krugersdorp.
Koesterfontein Farmers' Association, Secretary, *via* Krugersdorp.
Krugersdorp Farmers' Association, G. Figulus, Box 188, Krugersdorp.
Krugersdorp Agricultural Society, H. A. von Blommestein, Box 368, Krugersdorp.
Lydenburg Agricultural Society, S. Hiemstra, Box 69, Lydenburg.
Lydenburg Farmers' Association, E. de Souza, Lydenburg.
Leeuwdoorns Farmers' Association, W. H. Pilkington, Baviaans Poort, *via* Leeuwdoorns.
Low Country Farmers' Association, A. W. Gale, Middelrand, P.O. Devilskloof, Zoutpansberg, N. Transvaal.
Marico Agricultural Society, S. J. van der Spuy, Box 83, Zeerust.
Maquassi Farmers' Association and Agricultural Society, A. E. Grigson, Maquassi Station.
Middelburg Agricultural Society, J. W. Henwood, Box 229, Middelburg.
New Scotland Farmers' Association, H. S. Parry, Grasdal, Lake Chrissie.
New Agatha Farmers' Association, Henry W. Molyneux, P.O. New Agatha.
Pietersburg Agricultural Society, J. W. Johnson, Box 32, Pietersburg.
Pietersburg Farmers' Association, G. G. Munnik, Pietersburg.

Pietersburg Poultry Club, H. Moore, Box 103, Pietersburg.
Piet Retief Farmers' Association, K. P. van Dijk, Box 18, Piet Retief.
Pisanghoek Farmers' Association, W. J. Birchill, Diana, *via* Pietersburg.
Platrand Farmers' Association, A. H. Barron, Platrand.
Potchefstroom Agricultural Society, Joubert Reitz, Box 152, Potchefstroom.
Potchefstroom Burgher Land Settlements: The Manager, Box 172, Potchefstroom.
Potgietersrust Fruitgrowers' and Planters' Association, H. J. Ströbel.
Pretoria Agricultural Society, H. Cornforth, Box 685, Pretoria.
Rand Poultry Club, E. Hjort, Box 2213, Johannesburg.
Rustenburg Farmers' Association, Leo Machol, Rustenburg.
Settlers' Association, Hon. H. Wyndham, Kroomdraai.
Southern Waterberg Farmers' Association, W. S. Johnson, P.O. Warmbaths.
Southern Waterberg Farmers' Co-operative Union, T. T. Carney, Box 24, Warmbaths.
Standerton Agricultural Society, J. J. Bosman, Box 26, Standerton.
Transvaal Agricultural Union, F. T. Nicholson, Box 134, Pretoria.
Transvaal Farmers' Association, E. W. Hunt, Box 3785, Johannesburg.
Transvaal Land Owners' Association, H. A. Baily, Box 1281, Johannesburg.
Transvaal Poultry Club, M. Lochhead, Box 134, Pretoria.
Transvaal Stockbreeders' Association, F. T. Nicholson, Box 134, Pretoria.
Transvaal Tobacco Growers' Association, Capt. C. A. Madge, Secretary, Box 4303, Johannesburg.
Transvaal Con. Land Company, Capt. C. A. Madge, Box 4303, Johannesburg.
Trichardts Farmers' Association, E. v. Deventer, P.O. Trichardts, Springs.
Vaal River Farmers' Association, J. van Zijl, *via* Potchefstroom.
Waterberg Agricultural Society, J. von Backstroom, Box 7, Nylstroom.
Wakkerstroom Agricultural Society, G. Maasdorp, Box 87, Volksrust.
Witfontein Farmers' Association, J. Krugel, *via* Krugersdorp.
Witwatersrand Farmers' Association, H. J. A. Wentworth, P.O. Craighall, near Johannesburg.
Witwatersrand Dairy Farmers' Association, Alex. Sloan, Box 5908, Johannesburg.
Witwatersrand Agricultural Society, W. H. Poultney, Box 4344, Johannesburg.
White River Farmers' Association, Archibald T. Ralls, White River, *via* Nelspruit.
Wolmaransstad Farmers' Association, F. W. Konig, Box 1, Wolmaransstad.
Wolmaransstad Agricultural Society, W. D. de Greef, Wolmaransstad.
Wonderfontein Farmers' Association, Secretary, *via* Krugersdorp.
Woodbush Farmers' Association, Secretary and Treasurer, Percy Kent, Spitskop, P.O. Haenertsburg.
Zwartkop Farmers' Association, M. Vorster, Zwartkop, *via* Krugersdorp.
Zwartruggens Farmers' and Planters' Association, G. R. Wedderburn, J.P., Broadwood Vale, P.O. Kosterfontein, Rustenburg.
Zoutpansberg **Agricultural** Society, J. W. Johnston, Box **32**, Pietersburg.

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OTHER COLONIES.

Agricultural Union of Cape Colony, D. M. Brown, Box 187, Port Elizabeth.
Bloemfontein and O.R.C. Agricultural Society, J. Fraser, Box 250, Bloemfontein.
Cape Central Farmers' Association, H. C. Hall, Bedford, Cape Colony.
Cape Stud Breeders' Association, J. Pike, Box 703, Capetown.
Natal Agricultural Union, D. M. Eadie, Timber Street, Pietermaritzburg.
Orange River Colony Central Farmers' Association, W. B. Fowler, Secretary, Hill's Buildings, Maitland Street, Bloemfontein.
Orange River Colony Stockbreeders' Association, Secretary, Bloemfontein.
Rhodesian Agricultural Union, Secretary, Box 135, Salisbury, Rhodesia.
South African Co-operative Union, A. C. Lyell, Box 574, Bloemfontein, O.R.C.
Upper Klip River Farmers' Association, Secretary, Vrede District, O.R.C.

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TRANSVAAL LAND AND AGRICULTURAL BANK.

APPLICATION FOR LOANS.

It is hereby notified for general information that applications for loans from the Transvaal Land and Agricultural Bank will be received on and after the 4th November, 1907.

The Offices of the Bank have been opened at the Bourke Trust Chambers, Church Square, Pretoria, and all business must be done personally or through a Resident Magistrate, Assistant Resident Magistrate or Resident Justice of the Peace.

Forms of application are now ready and can be obtained from the Officials of the Bank and all Magistrates.

It is to be particularly observed that all applications should be made and lodged by the Applicants themselves, and not through Agents or second parties, and applications made by any other parties than the Applicants themselves will not be considered or acknowledged.

The Officials of the Bank and Magistrates will give all required information and will render all necessary assistance in the completion of forms of the application and otherwise.

Loans not exceeding in amount 60 per cent. of the agricultural and pastoral value will be made upon the security of freehold and quitrent land, and not exceeding 50 per cent. of its value, upon the security of land held under the Occupation Law.

The advances may be obtained either as a fixed loan repayable in one sum after a period not exceeding five years or as an instalment loan repayable by half-yearly instalments during a period not exceeding twenty-five years, with interest calculated at a rate not exceeding 6 per cent. per annum.

Except in special cases no advances will be made of amounts less than £50 and exceeding £2,500.

Insurance will not be specially required for the purposes of these loans as the advances will be made upon the basis of the value of the land irrespective of buildings.

Loans to Co-operative Societies which have been approved by the Minister of Agriculture will be made both on a fixed and instalment basis upon the value of raw or manufactured produce for the purposes and upon the conditions set forth in Section 30 of the Land and Agricultural Bank Act No. 26 of 1907.

All applications for loans must be accompanied by:

(1) A valuation of the property offered as security which should be made by a person duly approved of by the Magistrate.

(3) Fees upon the following scale:

On application not exceeding £200	£1
On application exceeding £200 and not exceeding £500 ...	£2
On application exceeding £500 and not exceeding £1,000 ...	£3
and for every additional £1,000 or part thereof... ...	£1

In the event of the loan being declined without any special valuation of the property having been made the fees less 10s. will be returned.

THOS. B. HEROLD,
Chairman.

Office of the Transvaal Land and Agricultural Bank,
Bourke Trust Chambers, Church Square,
Pretoria, 16th October, 1907.
P.O. Box 375.

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LIST OF OFFICIALS.

The following is a list of the officials of the Transvaal Department of Agriculture, to whom inquiries respecting matters connected with agriculture may be addressed:—

The Right Hon. the Minister of Agriculture	General LOUIS BOTHA.
Director	F. B. SMITH.
Division of Veterinary Science:	
(a) Bacteriology	A. THEILER.
(b) Contagious Diseases	C. E. GRAY.
Division of Chemistry	HERBERT INGLE.
Division of Botany	J. BURTT-DAVY.
(a) Plant Pathology	I. B. POLE-EVANS.
(b) Seed Introduction and Plant Experiments	H. G. MUNDY.
Division of Forestry	CHARLES E. LEGAT.
Division of Entomology	C. W. HOWARD.
Division of Horticulture	R. A. DAVIS.
Division of Tobacco	J. van LEENHOFF.
Division of Co-operation	B. STILLING-ANDERSEN.
Division of Dairying	ROBERT PAPE.
Division of Publications	WILLIAM MACDONALD.
Division of Poultry	REGINALD BOURLAY.
Government Experimental Farm, Potchefstroom	ALEXANDER HOLM.
Government Stud Farm, Standerton	A. McNAE
Government Stud Sheep Farm, Ermelo	V. BOSSLEY.
Government Experimental Farm, Tzaneen	WALTER H. CHARTER.
Translator	OTTO MENZEL.
Registrar of Brands	J. J. PIENAAR.
Librarian	J. C. GOLDMAN.

* * * *

ADDRESS.

Correspondents are earnestly requested to give their full name and correct postal address when forwarding any communication to the Department. It sometimes happens that readers send their farm address only, and fail to give the Post Office address, consequently it is impossible to reply to their queries or send publications. This refers more especially to farmers applying for cattle permits, as in many cases letters forwarded by the Veterinary Division are returned by the Postal Authorities to the effect "Not delivered. Address insufficient." The Department should also be immediately notified of any change of address.

SOUTH AFRICAN STUD BOOK.

A record of all classes of stock, the object being to encourage the breeding of thoroughbred stock and to maintain the purity of breeds, thus enhancing their value to the individual owner and to the country generally.

Application for membership and entries of stock should be addressed to—

For Cape Colony—J. Pike, P.O. Box 703, Capetown.
For Transvaal—F. T. Nicholson, P.O. Box 134, Pretoria.
For Orange River Colony—E. J. MacMillan, Government Buildings, Bloemfontein.

The South African Stud Book, Volume I., is obtainable from T. Maskew Miller, Adderley Street, Capetown. Price, 10s. 6d.

J. PIKE, *Secretary*,

South African Stud Book Association.

* * * *

DEPARTMENT OF IRRIGATION.

ADVICE TO FARMERS.

It is hereby notified for general information that the Irrigation Department is prepared to give advice to farmers on any farm relative to irrigation problems, in accordance with regulations approved by the Hon. the Minister for Lands.

Farmers are expected to facilitate the transport of the Irrigation Officials from farm to farm wherever possible.

Application should be made by letter to the Chief Engineer, Irrigation Department, Pretoria, or to the Resident Magistrate of the District.

F. A. HURLEY,
Chief Engineer, Irrigation.

* * * *

GOVERNMENT NOTICE No. 1186 OF 1907.

It is hereby notified for general information that, in order to promote the breeding of pure-bred stock, the following prizes will be offered by the Department of Agriculture at Agricultural Shows held in the Transvaal during the ensuing season :-

(1) Gold Medal, value £4 4s., for best colt or filly, under three years of age, got by a stallion the property of, or purchased from, the Department of Agriculture.

(2) Gold Medal, value £4 4s., for best pair of steers (oxen) or best pair of heifers, under three years of age, got by a bull the property of, or purchased from, the Department of Agriculture.

(3) Gold Medal, value £2 2s., for best two sheep, under two years of age, got by a ram the property of, or purchased from, the Department of Agriculture.

(4) Gold Medal, value £2 2s., for best two pigs, under two years of age, got by a boar the property of, or purchased from, the Department of Agriculture.

Conditions of Award:—

(1) Exhibits must have been bred by the exhibitor, and each entry must be accompanied by a certificate giving the particulars of the sire and the dam, or dams, of the animals entered.

(2) Any animal or animals which have won these prizes once shall not be eligible to compete again for the same prize, except at the Show of the Witwatersrand Agricultural Society.

(3) Any dispute arising on any of these conditions shall be referred to the Director of Agriculture, and his decision shall be final.

(4) Judges are requested to place the second in order of merit, where there is competition.

F. B. SMITH,
Director of Agriculture

Office of the Director of Agriculture,
Pretoria, 22nd October, 1907.

TRANSVAAL METEOROLOGICAL DEPARTMENT.

OBSERVATIONS OF TEMPERATURES (FROM SELF-REGISTERING THERMOMETERS IN STEVENSON SCREENS).—FEBRUARY, 1908.

PLACE.	FOR THE MONTH. Mean Max.	Mean Min.	Mean.	HIGHEST.	LOWEST.
	degs.	degs.	degs.	degs.	degs.
Bloemhof	88·9	61·6	75·2	94·0 on the 3rd, 10th, 28th	57·0 on 18th
Johannesburg-Observatory ...	77·5	56·5	67·0	81·9 ,, 15th	51·0 ,, 7th
Komatipoort	94·9	69·9	82·4	105·0 ,, 22nd, 26th	64·0 ,, 14th
Pietersburg	82·7	58·5	70·6	91·0 ,, 25th, 26th	50·0 ,, 16th
Pretoria, Arcadia ...	87·6	59·5	73·6	94·2 ,, 22nd	51·7 ,, 20th
Standerton	81·6	55·0	68·3	89·0 ,, 28th	45·0 ,, 19th, 20th
Volksrust	77·5	53·1	65·3	85·0 ,, 28th, 29th	43·0 ,, 19th
Zeerust	89·0	63·0	76·0	98·0 ,, 21st	53·0 ,, 20th

Temperatures by day have averaged 3 to 5 degrees above the mean for February, whilst the temperatures by night have been normal. The extreme range of temperature has been unusually great for the time of the year.

RAINFALL RETURN FOR FEBRUARY, 1908.

(Including Rainfall since 1st July last and averages for previous season.)

NOTE.—The rainy season is measured from 1st July in one year to the 30th June in the next.

DISTRICT.	PLACE.	MONTH. Feb., 1908. Ins.	Days.	SEASON. From 1st July, 1908. Ins.	Days.	AVERAGES. February. Ins.	Days.	Season. Ins.	Days.
Barberton ...	Barberton	0·73	3	14·03	57	5·90	12	21·80	57
	Komatipoort	2·99	4	10·08	36	5·41	9	21·05	50
Bethal ...	Bethal	3·2	9	23·10	69	4·49	11	18·13	64
Bloemhof ...	Bloemhof	1·54	12	13·51	54	3·49	10	14·13	48
Carolina ...	Carolina	1·42	4	20·16	52	3·49	11	23·05	—
Ermelo ...	Ermelo	2·13	8	21·51	65	5·98	11	26·27	76
Heidelberg ...	Heidelberg	2·92	8	18·98	63	6·36	12	22·90	58
	Vereeniging	2·36	10	18·15	62	5·31	12	19·20	60
Lichtenburg	Lichtenburg	4·58	14	18·05	55	3·66	11	15·47	56
Lydenburg ...	Pilgrims Rest	3·20	12	20·90	79	10·32	19	28·38	91
	Belfast	0·98	6	—	—	3·66	15	24·70	84
Marico ...	Zeerust	2·25	6	16·94	46	4·55	13	17·29	57
Middelburg ...	Middelburg	3·04	10	20·60	67	4·10	11	22·24	67
Piet Retief ...	Piet Retief	0·77	13	—	—	—	—	—	—
Potchefstroom	Potchefstroom	3·56	14	18·76	60	4·29	10	18·32	54
	Klerksdorp	2·45	12	13·73	67	4·79	14	16·59	62
Pretoria ...	Arcadia, Pretoria ...	1·50	11	17·83	65	4·41	13	20·27	65
	Govt. Buildings, Pretoria	1·24	8	15·87	56	4·82	11	18·68	58
	Modderfontein	2·23	11	15·73	60	5·17	14	21·06	67
Rustenburg ...	Rustenburg	2·13	12			—	—	—	—
Standerton ...	Standerton	1·67	8	24·26	72		—	—	—
Swaziland ...	Mbabane	3·51	11	34·93	96	8·33	16	33·98	91
Wakkerstroom	Volksrust	1·22	11	22·21	76	6·30	13	25·93	68
	Wakkerstroom	1·49	6	23·06	53	—	—	—	—
Waterberg ...	Potgietersrust	2·86	7	16·41	49	4·30	11	21·77	50
	Nylstroom	2·35	9	17·28	52	4·96	12	19·62	56
Witwatersrand	Krugersdorp	2·64	9	18·62	65	—	—	—	—
	Joubert Park, J'burg ...	2·36	11	20·79	74	6·66	15	25·58	68
	Govt. Observatory, J'burg	1·98	10	18·31	70	5·98	15	22·54	69
Wolmaransstad	Wolmaransstad	2·90	10	14·79	56	3·97	10	14·09	47
Zoutpansberg	Pietersburg	2·99	10	13·14	45	4·34	9	16·96	45
	Leydsdorp	3·29	5	14·44	24	—	—	—	—

SUMMARY.—Rainfall has been very deficient during the month. At Johannesburg and Pilgrims Rest, for which places observations for 20 years are available, the present February has the lowest total rainfall on record; at Pretoria the rainfall in February, 1898 (1·09 inches) was somewhat scantier.

A few very local, but heavy, thundershowers occurred during the month, Lichtenburg getting the best of these. Complaints of want of rain and water are prevalent. The shortage on the season is 3 inches below average at Pretoria and 5 inches on the Witwatersrand.

OBSERVATIONS OF TEMPERATURES (FROM SELF-REGISTERING THERMOMETERS IN STEVENSON SCREENS).—MARCH, 1908.

Place.	For the Month. Mean Max.	Mean Min.	Mean.	Highest.	Lowest.
	degs.	degs.	degs.	degs.	degs.
Barberton	82·2	60·8	71·5	92·8 on 13th	56·5 on 3rd & 25th
Bloemhof	87·5	56·3	71·9	94·0 „ 11th & 12th	45·0 .. 17th
Johannesburg Observatory ...	72·2	53·2	62·7	84·3 „ 13th	47·7 „ 25th
Pietersburg	79·0	56·8	67·9	88·0 „ 13th	51·0 „ 8th
Pretoria, Arcadia ...	83·5	55·2	69·4	93·0 .. 13th	49·3 „ 7th
Standerton	77·4	52·3	64·8	90·0 „ 13th	43·0 „ 13th
Volksrust	74·6	48·7	61·6	87·3 „ 13th	43·3 .. 14th
Zeerust	85·0	56·7	70·8	96·0 „ 13th	47·5 .. 17th

The mean temperatures have been normal, but the daily range has been greater than usual in March; maxima by day have been somewhat higher and minima by night somewhat lower than the average.

RAINFALL RETURN FOR MARCH, 1908.

(Including Rainfall since 1st July last and the corresponding averages of previous seasons.)

NOTE. The rainy season is measured from 1st July in one year to the 30th June in the next.

District.	Place.	Month. Mar., 1908. Ins.	Days.	Season. From 1st July, 1907. Ins.	Days.	Averages. Month. Ins.	Days.	Season. Ins.	Days.
Barberton ...	Barberton	2·58	12	16·61	69	2·74	9	24·58	66
	Komatipoort	6·71	8	16·79	44	1·61	6	22·99	56
Bethal ...	Bethal	3·24	15	26·24	84	2·67	8	24·28	72
Bloemhof ...	Bloemhof	2·40	11	15·94	68	2·96	10	17·10	58
Carolina ...	Carolina	2·23	11	22·39	63	2·55	7	—	—
Ermelo ...	Ermelo	2·71	15	24·25	80	3·86	13	30·13	89
Heidelberg ...	Heidelberg	3·59	16	22·57	79	2·72	9	25·13	68
	Vereeniging	4·13	13	22·28	75	3·11	11	22·31	71
Lichtenburg...	Lichtenburg	0·96	7	19·01	62	2·56	9	18·03	66
Lydenburg ...	Pilgrims Rest	3·72	13	24·62	92	5·20	19	33·55	111
Marico ...	Zeerust	1·80	11	18·71	57	2·56	12	19·85	69
Middelburg ...	Middelburg	2·31	15	22·94	82	2·65	10	24·23	78
Potchefstroom	Potchefstroom	3·27	12	22·03	72	2·22	11	20·54	65
	Klerksdorp	3·65	16	17·63	78	4·34	13	20·93	74
Pretoria ...	Govt. Buildings, Pretoria	1·48	14	17·35	70	2·67	8	22·02	66
	Arcadia, ..	1·95	17	19·78	82	3·05	11	23·99	76
	Modderfontein	6·00	19	21·73	79	2·48	12	23·54	86
Rustenburg ...	Rustenburg	3·06	8	—	—	—	—	—	—
Standerton ...	Standerton	5·07	18	29·33	90	—	—	—	—
Swaziland ...	Mbabane	3·74	14	38·67	110	4·80	13	38·78	104
Wakkerstroom	Volksrust	3·70	14	25·91	90	3·38	13	29·31	78
	Wakkerstroom	4·81	12	27·87	65			—	
Waterberg ...	Nylstroom	1·57	9	18·85	61	2·33	8	21·95	64
	Potgietersrust	2·29	9	18·66	58			—	—
Witwatersrand	Krugersdorp	3·22	16	21·84	81	—		—	—
	Joubert Park, J'burg ...	5·59	15	26·38	89	3·49	11	29·07	79
	Govt. Observatory, J'burg	5·11	14	23·42	84	3·22	11	25·76	79
Wolmaransstad	Wolmaransstad	2·89	9	18·25	65	3·73	9	17·83	56
Zoutpansberg	Pietersburg	1·96	9	15·10	54	2·87	9	19·83	58
	Louis Trichardt... ...	2·62	9	17·50	65	—	—	—	—
	Leydsdorp	0·59	5	—	—	—	—	—	—

SUMMARY.—Along the southern border the March rainfall was up to the average: over the centre, north, and east of the Transvaal the rainfall was deficient. The drought which has prevailed more or less since December was generally broken by rains during the last week of March. Rivers and spruits remain, however, very low, and it is now almost too late to expect sufficient rainfall to make them run well.

Generally, the season's total is below the average by three to five inches.

Observations of Temperatures (from Self-registering Thermometers in Screens).—April, 1908.

Place.	For the Month. Mean Max.	Mean Min.	Mean.	Highest.	Lowest.
	degs.	degs.	degs.	degs.	degs.
Barberton	77·4	53·4	65·4	92·5 on 9th	45·7 on 12th
Bloemhof	73·6	40·6	57·1	81·0 „ 8th & 15th	32·0 „ 12th
Johannesburg Observatory ...	66·7	45·5	56·1	71·0 „ 1st	34·0 „ 10th
Pietersburg	76·2	46·5	61·3	86·0 „ 9th	34·0 „ 22nd
Pretoria, Arcadia ...	77·7	42·6	60·2	86·6 „ 2nd	34·2 „ 12th
Standerton	71·6	37·0	54·3	79·0 „ 17th	26·0 „ 12th
Wakkerstroom	65·0	37·8	51·4	75·2 „ 16th	27·0 „ 12th
Zeerust	78·2	40·1	59·1	87·1 „ 3rd	33·2 „ 12th

April had all the characteristics of a winter month, it having been nearly cloudless and rainless with low temperatures by night. The day temperatures were somewhat below average, whilst the night temperatures were much lower than recorded before in this month since regular observations were started. Old residents state that the onset of frost over the high veld so early in the season was at least very unusual.

Rainfall Return for April, 1908.

(Including Rainfall since 1st July last and the corresponding averages for previous seasons.

Note.—The rainy season is measured from 1st July in one year to the 30th June in the next.

District.	Place.	Month. Apl., 1908. Ins.	Days.	Season. From 1st July, 1907. Ins.	Days.	Averages. Month. Ins.	Days.	Season. Ins.	Days.
Barberton ...	Barberton	1·44	4	17·75	73	2·09	7	26·94	77
	Komatipoort	2·38	5	19·17	49	2·44	7	25·14	63
Bethal ...	Bethal	0·64	1	26·98	85	1·88	7	26·16	80
Bloemhof ...	Bloemhof	0·23	4	16·26	72	2·46	8	19·56	67
Ermelo ...	Ermelo	0·72	2	26·09	83	2·27	8	32·41	97
Heidelberg ...	Heidelberg	0·19	2	22·76	81	2·16	7	24·53	75
	Vereeniging	0·32	1	22·60	76	2·38	10	24·70	84
Lydenburg ...	Belfast	0·59	3	25·89	65	2·29	10	30·55	74
	Pilgrims Rest	1·06	18	25·68	110	2·40	12	35·96	126
Marico ...	Zeerust	0·03	1	18·77	58	2·54	8	22·37	78
Middelburg ...	Middelburg	0·16	1	23·40	83	1·64	7	25·87	55
Piet Retief ...	Piet Retief	1·97	6		—				..
Potchefstroom	Potchefstroom	drops	0	22·03	72	2·70	7	23·24	72
	Klerksdorp	0·40	1	17·73	79	2·79	9	23·72	85
Pretoria ...	Arcadia, Pretoria ...	0·11	1	19·92	83	1·75	6	25·74	83
	Govt. Buildings, Pretoria	0·06	1	17·41	71	1·51	6	22·87	72
	Modderfontein	0·35	1	22·08	80	2·45	8	26·09	87
Rustenburg ...	Rustenburg	0.15	5			1·74	-		
Standerton ...	Standerton	1·86	5	31·19	95	2·03	7	..	
Swaziland ...	Mbabane...	2·85	7	41·52	117	4·50	13	43·28	118
Wakkerstroom	Volksrust	1·99	6	27·90	96	2·14	10	31·12	89
	Wakkerstroom	2·39	3	30·26	68	--		-	
Waterberg ...	Nylstroom	0·12	2	18·97	63	0·49	4	22·16	67
Witwatersrand	Krugersdorp	0·19	2	22·05	84	—-		—	..
	Joubert Park, J'burg ...	0·19	1	27·48	91	2·13	10	31·24	89
	Govt. Observatory, J'burg	0·07	1	23·49	85	1·77	9	27·54	88
Wolmaransstad	Wolmaransstad	nil	0	18·25	65	2·58	8	20·42	64
Zoutpansberg	Pietersburg	0·58	3	15·68	57	0·95	4	20·78	59

Summary.—Rainfall was very deficient in April. At Pretoria and Johannesburg, for which comparatively long returns are available, April, 1908, is the driest on record.

Fairly good, but by no means abundant rains fell in the S.E. corner of the Colony, but elsewhere a winter drought prevailed. The season's rainfall is now 6 inches below the average at Pretoria and 4 inches on the Witwatersrand.

PRETORIA PRODUCE MARKET PRICES.

(Supplied by the Commercial Agency Co., Limited, Seed and Produce Merchants, No. 116 Vermeulen Street, Telephone No. 165, Box 784, Pretoria: and by Messrs. Hubert Morisse & Co., Produce Merchants and Commission Agents, Loveday and Frederick Streets, Box 68, Johannesburg.)

PRETORIA.

Description.	*March*, 1907.						*April*, 1908.						*May*, 1908.					
	Lowest.			Highest.			Lowest.			Highest.			Lowest.			Highest.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Bran, per bag	0	7	0	0	8	9	0	8	9	0	8	10	0	9	0	0	9	6
Barley, per bag	0	12	0	0	14	0		-					0	8	6	0	12	6
Butter, per lb.	0	1	0	0	1	3	0	1	1		—		0	1	4	0	2	0
Beans, dry, per lb.... ...					-			—			-			-		0	0	3
Ducks, each	0	2	6		—		0	1	10	0	2	0	0	1	9	0	2	6
Eggs, per doz.		—			- -						-		0	1	5	0	1	9
" (fresh) ...	0	2	0	0	2	6	0	1	9	0	2	4	0	1	9	0	2	6
Forage, 100 bundles (best)	0	11	6	0	17	6	0	10	0	0	11	0	0	9	0	0	17	0
" (100 lbs. bale) ...	0	4	9	0	5	6		---			---			—			- -	
Fowls, each	0	1	5	0	1	9	0	1	6	0	2	5	0	1	1	0	2	8
Fruit (dried), per lb. ...					-			-			—		0	0	4	0	0	6
Geese, each...	0	8	9					—					0	8	0			
Hay (sweet), per bale ...	0	0	6	0	0	8								-				
" " ...	0	0	2	0	0	1	0	0	1	0	0	6	0	0	3½	0	0	6
Kaffir Corn, per bag ...					-		0	10	0	0	12	0	0	10	0	0	10	9
Green Lucerne, per doz. bundles	0	1	0	0	1	6	0	1	0	0	1	6	0	1	9			
Green Lucerne, per bale ...		.			—		0	2	10	0	3	0					- -	
Mamna, per 100 bundles ...	0	3	9	0	4	6	0	2	0	0	3	6	0	1	0	0	1	6
Mealies, per bag	0	9	3	0	9	9	0	8	9	0	9	6		-			-	
White Mealies, per bag ...								-					0	8	3	0	8	9
Yellow Mealies		- -			—			- -					0	9	0	0	9	9
Onions, per bag	0	11	0	0	11	6	0	5	0	0	9	0	0	18	0	0	18	6
Pigs, each	0	15	0	2	18	0	0	16	6	1	2	0	0	15	0	3	0	0
Pigeons, each											-		0	1	0		-	
Pumpkins, each								-					0	0	4	0	1	0
Potatoes, per bag	0	6	6	0	11	6	0	11	0	0	12	6					-	
" (best), per bag ...		-						---					0	10	0	0	14	0
" (inferior) " ...					--			- -			—		0	6	0	0	9	0
" (sweet)					-		0	3	6	0	4	0	0	3	0	0	4	0
Oats (seed), per bag ...	0	7	6	0	8	0	0	9	3	0	12	0	0	7	6	0	9	6
Boer Meal, per bag ...	1	5	6				1	5	0				1	6	0	1	11	0
Turkeys, each	0	1	0	0	10	0	0	1	3	0	5	9	0	4	0	0	8	0
Muscovies, each	0	2	0	0	2	6	0	1	10	0	1	7	0	2	6	0	3	0
Tobacco, per roll	0	0	3	0	0	9	0	0	9				0	0	6	0	0	9
" cut, per lb. ...		-			-			---					0	0	9	0	1	0
Wheat, per bag	1	1	6	1	2	6		—			-		1	3	6		--	
Firewood, per load ...	0	15	0	1	15	0	0	13	0	1	9	0	0	15	0	1	10	0
Chaff, per bale	0	0	9		—		0	3	9	0	4	3		—			—	
" (pressed) ...		--			- -		0	0	9	0	1	0		-			—	
Monkey Nuts, per bag ...	0	7	6				0	9	6	0	10	0		--			—	
Salt, per bag					-		0	6	9		---			-			—	

Indian Agricultural Research Institute (Pusa)
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